

Jail in US

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Sweet smell of success at Unilever, Page 17

World news Business summary

US denies attempt to provoke Libya

The Reagan Administration insisted joint US-Egyptian military manoeuvres that began in the Mediterranean on Sunday were not intended to provoke Libya and had been planned for many months.

People Express grounds Frontier

PEOPLE EXPRESS, aggressive low-cost US airline, grounded its Frontier subsidiary and warned that Frontier could be forced into bankruptcy proceedings if its pilots did not agree to a new wages deal.

Bhutto faces charges

The Pakistan Government is expected to decide next week what charges to bring against Mrs Benazir Bhutto and other opposition leaders who were jailed two weeks ago when violent demonstrations swept through the country protesting against the rule of President Zia-ul-Haq. Page 3

Japanese to pay 'dump' levy on copiers

The Japanese government has announced a 15.8 per cent anti-dumping duty on Japanese copiers. The move, which is likely to be fiercely contested by the companies, is a further sign of the Commission's determination to pursue what it sees as unfair Japanese pricing practices. In the past couple of years, anti-dumping duties have been imposed on Japanese electronic typewriters, excavators, roller bearings and outboard motors.

Cameroon President says volcanic gas killed 1,200

AT LEAST 1,200 people are feared to have been killed by toxic gas seeping from a remote volcanic lake in north-west Cameroon, the country's President Paul Biya said yesterday. Mr Georges Nngano, Information Minister, said earlier that military reports from the scene estimated a death toll of at least 2,000. Mr Nngano said that between 200 and 300 people suffering from the effects of the gas fumes were being treated in hospital and that army teams were searching the 4 sq mile disaster area for more victims.

Some survivors of the leak, which occurred on Friday, have been evacuated by helicopter, but most are reported to be still in the affected area, around Lake Nios about 250 miles north-west of Yaounde, the capital. Early rescue attempts had been hampered by a lack of breathing apparatus and oxygen. President Biya, who visited the area on Sunday, has declared it a disaster zone and appealed for international aid. A French medical team arrived in the country yesterday and Britain, the US and Switzerland have also pledged assistance. The Foreign Office in London said last night that Britain would give "speedy and sympathetic" consideration to any request for aid, although no official appeal had been received. Mr Shimon Peres, the Israeli Prime Minister who arrived on an official four-day visit to the West African country yesterday, took a 20-member army medical team equipped with oxygen and breathing apparatus to help with rescue efforts. The Government said that the gas which caused the disaster was hydrogen sulphide. It smells like rotten eggs and can paralyse respiration if breathed in sufficient concentrations. The gas, which is often found in volcanic areas, inhibits the functioning of the central nervous system. French and US scientists said, however, that the gas could have been either carbon monoxide or carbon dioxide, thought to have been the cause of a similar incident in the same mountain chain in 1984, in which 30 people died. The leak is believed to have been caused by an eruption or an underground landslide on the bed of the lake which lies in a volcanic crater. Three villages are thought to have been affected and the 10,000 inhabitants of the nearest large town, Wum, were being evacuated. The Government has established a crisis centre at Bamenda, capital of the English-speaking north-western province.

Cadbury buys 30% of Dr Pepper for \$17.5m

CADBURY SCHWEPPE'S, the UK confectionary and soft drinks group, has expanded its US interests by buying a 30 per cent stake in the Dr Pepper Company, makers of the secret formula drink which has 7 per cent of the US soft drink market. In June, Cadbury-Schweppe's spent \$230m buying the Canada Dry and Sunbelt soft drinks businesses. Cadbury Schweppe's said yesterday that the group had concluded a \$17.5m deal with financial institutions and the Dr Pepper management to take the stake as part of a leveraged buyout. "Our business is being geared very strongly towards confectionery and soft drinks" it said. Last week, a consortium consisting of Shearson Lehman Brothers, part of the New York investment bank, together with Hicks and Hallas, a Dallas investment company, and members of the management of Dr Pepper, announced that they had purchased the company from Forstmann Little for \$418m. Earlier this month, Coca-Cola was forced to drop a \$470m takeover plan for Dr Pepper after anti-trust objections. Cadbury Schweppe's said the investment in Dr Pepper was strategic and there were no plans to purchase control. Mr Thomas Hicks of Hicks and Hallas confirmed this, adding that "there is no agreement for Cadbury Schweppe's to increase its holding and no plans exist to go public." Cadbury Schweppe's is to have two seats on a planned nine-member Dr Pepper board. Dr Pepper will have four shareholders under the new scheme agreed late on Friday. According to Mr Hicks, his company together with the management, Cadbury Schweppe's and Shearson Lehman will each hold about 30 per cent of the reduced equity totalling \$58m. Forstmann Little is to retain a 5 per cent stake. Most of last week's discussions centred on the debt financing arrangements for the buyout. To complete the deal with Forstmann, Shearson Lehman lent Dr Pepper \$118m which will soon be recovered through an issue on non-convertible subordinated loan stock. A further loan of \$240m was made to the investing group by Bankers Trust. In 1985, 19 per cent of Cadbury Schweppe's \$1.5bn (\$2.9bn) sales were in North America but the region turned in a \$5.6m trading loss for the group. Following the loss, a

Tamil talks threat

Renewed separatist violence at the weekend in which 10 people were killed has threatened peace talks between the Sri Lankan Government and moderate Tamils.

Sikhs arrested

Indian police arrested two Sikhs suspected of assassinating General Arun Vaidya who commanded the army when the Golden Temple in Amritsar was stormed in 1984.

Fire penalties sought

French politicians sought stiffer penalties for arson after weekend fires swept through big tracts of scrub forest in the south-east, causing five deaths and leaving a trail of burnt houses and charred bush. Page 3.

Soweto student riot

South African police fired with shotguns at students in Soweto for a patrol one was killed and eight wounded.

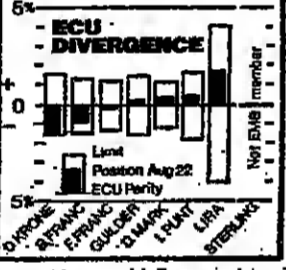
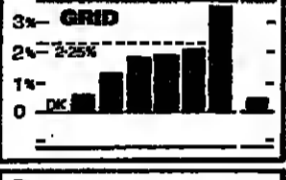
Food aid

The United Nations Food and Agriculture Organisation has approved food aid worth nearly \$28.2m for refugees in Pakistan and Central America and victims of strife and poor harvests in Lebanon.

Ugandan budget

In its first budget aimed at stimulating domestic production, Uganda's National Resistance Movement government discarded free market policies advocated by ex-President Milton Obote for a more managed approach to the economy. Page 2

EMS Aug 22, 1986



The chart shows the two constraints on the European Monetary System, exchange rates. The upper chart, based on the weakest currency in the system, defines the cross rates from which no currency (except the lira) may move more than 2% per cent.

TOKYO share prices surged on widespread bargain hunting, pushing the Nikkei index up 432.78 points, to 18,565.61, a record one-day gain which wiped out more than half the losses of the last three sessions. Page 30

WALL STREET: At 3pm, the Dow Jones industrial average was 10,971 lower at 1,878.93. Page 30

LONDON stock markets were closed for a holiday.

DOLLAR closed in New York at DM 2.0415 (DM 2.0410), SF 1.6435 (SF 1.6445), FF 6.69 (FF 6.6975) and ¥183.70 (¥183.15). The London market was closed. Page 19

STERLING closed in New York at \$1.4805 (\$1.4875). The London market was closed. Page 19

GOLD: The London market was closed. In Zurich the price was fixed at \$380.50 and in Paris it ended at \$386.50. In New York the December Comex settlement was \$386.50 against \$390.60 on Friday.

BANK OF ENGLAND is planning an experimental auction of government securities, similar to the US Treasury's bond auction. Page 14; details Page 16

ALBERT WOLLINGER is to step aside as chief economist at First Boston, the US securities firm, although he will continue as a managing director and senior adviser. Men and Matters, Page 12

FRUEHAUF, US automotive parts and truck company, agreed to a sweetened \$1.12bn leveraged buy-out bid led by Merrill Lynch, Wall Street securities firm, and Fruehauf's senior managers. Page 16

UNILEVER, Anglo-Dutch food and detergent group, has raised its stake in Naarden, Dutch flavours and fragrances group, from 40 per cent to 49 per cent. Background, Page 17

Soviets admit design flaws at Chernobyl

MAJOR FLAWS in the design must share the blame with human error for the nuclear reactor catastrophe at Chernobyl, it was disclosed here yesterday at the international "post mortem" on last April's accident. Academician Valery Legasov, a leading Soviet nuclear scientist, heading a large Soviet delegation to the meeting being hosted by the International Atomic Energy Agency (IAEA), spoke of a "tremendous psychological mistake on the part of the designers of this reactor". Dr Ivan Emelyanov, chief designer of the RBMK reactor, was dismissed last month. He redressed an imbalance in which Moscow previously had heaped most of the blame on operators who, he said, were no longer alive. While he gave no indication that Moscow was ready to shut down its RBMK reactors, he made it clear that they were giving priority to new construction to the 1,000 MW pressurized water reactor (PWR) and to newer designs. In the case of one of the errors - operating the reactor with as few as five control rods in place - he said: "No one in the whole world, including the Prime Minister of the country, was allowed to operate this reactor with fewer than 15. Mr Legasov admitted several crucial design weaknesses in the RBMK. They included its inherent instability, the possibility of exhibiting a feature called "positive void coefficient", its need for a complex control system, the complexity of its plumbing and the fact that its graphite core normally ran very hot. Lord Marshall, chairman of the UK Central Electricity Generating Board, interviewed later, said Mr Legasov's list of design weaknesses tallied very closely with one produced in Britain shortly after the accident to demonstrate the basic weaknesses of this design. Nuclear test ban, Page 3

Mexico plans to draw on \$1.6bn bridging loan

MEXICO hopes to start drawing this week on the \$1.6bn bridging loan agreed by leading industrial countries and banks to bolster its reserves while it negotiates longer term assistance in servicing its \$68bn foreign debt. The drawings will come from the \$1.1bn to be provided by the US Treasury as well as the central banks of industrial countries and five Latin American nations. Commercial banks which are to lend \$500m have made their portion of the loan conditional on progress first being achieved in syndicating some \$60m in fresh, medium-term credits to the Government of President Miguel de la Madrid. Nonetheless, the fact that more than \$1bn should become available to Mexico this week will help to secure a continued flow of interest payments to bank creditors while the rest of the package is negotiated. Talks last week in New York between Mr Angel Curria, the senior Mexican Finance Ministry official responsible for debt negotiation, and leading creditor-banks were mainly designed to pave the way for the start of drawings on the bridging loan. Though the banks do not at present have to make cash available, the formal consent to the bridging operation of about 50 leading creditor institutions, each of which has more than \$400m outstanding to Mexico, was necessary before the credit from other sources could be drawn. This has proved a time consuming process since it has been necessary for each bank to obtain top level approval for the deal. Particularly complicated is the situation facing London-based consortium banks with a wide range of separate shareholders, each of whom has to be consulted at a time when

Table with 3 columns: Company, Dumping margin (%), Anti-dumping duty (%). Lists Canon, Copier, Fuji Xerox, Konishiroku, Kyocera, Matsushita, Minolta, Nita Industrial, Ricoh, Sanyo, Sharp, Toshiba.

Fermenta's unions reject Montedison

LOCAL TRADE unions in Fermenta, the Swedish chemicals and biotechnology group, yesterday rejected the planned takeover of the company by Montedison, the Italian chemicals and health care group, plunging the future ownership of the company into fresh uncertainty. Trading in Fermenta shares was suspended until further notice by the Stockholm stock exchange pending clarification of the Montedison deal. In July, the Italian company agreed in principle with Mr Refaat El-Sayed, the Egyptian-born Fermenta group chief executive, to buy his controlling stake of some 78 per cent of the votes and 44 per cent of the equity. The takeover would be worth at least SKr 3bn (\$441m). The deal was subject to the approval of the workforce, the Fermenta board and the Swedish Government. The Fermenta board, which met two weeks ago to consider the deal, has been forced to adjourn twice because of trade union opposition to the Montedison takeover. Continued on Page 14

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Contents table listing various sections such as International, World Trade, Britain, and specific market reports like Cars, Technology, and Aerospace.

OVERSEAS NEWS

Pentagon denies attempting to provoke Libyans

BY REGINALD DALE, US EDITOR, IN WASHINGTON

THE REAGAN Administration yesterday insisted that joint US-Egyptian military manoeuvres that began in the Mediterranean on Sunday were not intended to provoke Libya, and had been planned for many months. Although Libya has denounced the manoeuvres as a terrorist plot, and Moscow has criticised them as "openly provocative," a Pentagon official said the US had never had Libya in mind in mounting the exercise. Planning had started before the outbreak of tension that culminated in the US bombing raid on Libya in April, he said. The Pentagon described the manoeuvres as "routine" and said no American or Egyptian aircraft or ships would enter the disputed Gulf of Sirte or cross the "line of death" designated by Col Muammar Gaddafi, the Libyan leader. The exercise, code-named Sea Wind, was intended to underscore continuing security ties between the US and Egypt, following strains in the relationship last year after the US forced an Egyptian airliner carrying the Achille Lauro hijackers to land in Sicily, US officials said.

John Deere shuts plants after union calls strikes

By William Hall in New York

JOHN DEERE, the world's biggest farm equipment manufacturer, which is expected to post its first annual loss in over 50 years, yesterday closed all but one of its US factories after its workforce began selective strikes at three key plants. The United Auto Workers (UAW), the biggest of Deere's unions, ordered its members to strike at three facilities at midnight on Friday, and Deere said yesterday that it had been forced to close all of its union organised plants as a result. The three plants supply key equipment for other plants. However the union described the move as a lock-out and ordered its workers to turn up for work yesterday. About 12,500 workers are directly affected by the dispute. Another 9,000 union members are currently laid off but have the right of recall. Deere is continuing to operate a non-union plant at Horicon, Wisconsin, and said that its overseas operations are continuing to work normally. However, its US plants supply its overseas operations with parts and if the dispute continues for long, then it is likely to cause further disruption.

KAMPALA BUDGET ABOLISHES DUAL EXCHANGE RATE

Uganda discards Obote's policies

BY OUR KAMPALA CORRESPONDENT

IN ITS first budget the government of Mr Yoweri Museveni's National Resistance Movement (NRM) has discarded the free market policies advocated by Uganda's former President Milton Obote for a more managed approach to the economy. Abolishing the dual exchange rate introduced as a compromise measure in May, the Government has acted to peg the shilling at the rate for priority imports of 1,400 shillings to one US dollar compared with the former market exchange rate of 5,000 shillings to the dollar. The two-tier system was introduced in a mini-budget in May. Under this, the priority exchange rate applied only to essential imports, foreign debt repayments and exports channelled through public corporations such as the Coffee Marketing Board. The system rapidly bit the prices of many goods imported privately, contributing to inflation rate estimates at up to 200 per cent. The drastic revaluation will be accompanied by the introduction of a new currency in several months' time. In Kampala one investor described the new exchange rate as nightmarish, saying it

will be very difficult to make ends meet with the rising cost of labour and fuel. Western diplomats also expressed doubts saying the big question was whether it would affect the parallel market. Hard currency on the black market fetched two to three times the official rate yesterday. The black market has been boosted in recent months by a shortage of hard currency. It also remains to be seen whether the new rate will lower the cost of consumer goods. Local shopkeepers automatically raise prices on Saturday afternoons and many people appear baffled about the

budget's real implications and complained of rising fuel prices. The petrol price rose by 100 per cent last week. Mulema described the financial year 1988/89 as abnormally difficult because of the cost of relief to areas affected by war and an increased wage bill for the police and army. The result was a deficit of 104.6bn shillings (85m), he said. The budget deficit in the current year, to be financed by borrowing, would be 349.7bn shillings (\$248m), with expenditure at 1,127.5bn (\$806m) exceeding revenue at 777.8bn (\$556m), he added. Concessions to commercial

banks opening rural branches are to be abolished from start of 1987. Corporation tax on financial institutions has risen by 10 per cent and commercial activities will double.



President Museveni.

Argentine ministers discuss economic package

BY TIM COONE IN BUENOS AIRES

THE NOMINATION of Dr Jose Luis Machinea, the deputy Economy Minister, as the new president of Argentina's central bank, has raised expectations over the launching of a package of economic measures shortly to combat the unexpected growth of inflation in the Argentinian economy in July and August. Economic ministers held lengthy discussions over the weekend to analyse the principal causes of the acceleration

in the rate of inflation and to adopt measures which are expected to include a relaxation of import controls on basic consumer items, especially foodstuffs, a continuation of a policy of regular mini-devaluations and further tightening of monetary controls. Following the announcement of his appointment, Dr Machinea said that the economic team will now act with greater coherence having

clearly defined the monetary policy to be followed. Mr Juan Sourrouille, the Economy Minister, told bankers and economists gathered for the inauguration of an Argentinian banking conference yesterday that the rise in the inflation rate was a result of current seasonal food shortages. He acknowledged that the inflationary reaction was greater than predicted but dismissed claims that the Austral Plan, the Government's economic

stabilisation programme, had collapsed. "We are now in a better condition to combat inflation than we were over a year ago when the Austral Plan was launched as the fiscal deficit and balance of payments are now under control. This gives us room for manoeuvre to stabilise prices," he said. He added that Argentina's financial system also needed "cleaning up" through the "institutionalisation of transactions," a reference to the

black market in foreign exchange and credit dealings that have mushroomed over the past year, due to tight restrictions on credit creation by the official banking system. Many of the black market operators stand to lose heavily on unsupported futures deals in US dollars which have to be closed on Friday. The 30 per cent drop in the value of the Austral against the US dollar this month has left many dealers heavily exposed.

Venezuela to pay \$750m of foreign debt this year

BY JOSEPH MANN IN CARACAS

A HIGH-LEVEL official at Venezuela's Ministry of Finance said this weekend that the Government planned to pay foreign banks a \$750m (\$900m) principal payment before the end of this year. Mr Jorge Marciano, Finance Director at the Ministry, also said he did not want to comment on whether the Government would ask foreign banks to loan it \$250m so that the \$750m principal payment could be made as planned. He added that it was not appropriate to mix together comments about an agreed-upon loan payment and a possible future loan. Mr Marciano's comments referred to a sticky problem that developed after the Venezuelan Government and foreign banks signed a loan restructuring agreement on February 22. The agreement, covering about \$29.8bn in private sector debts to around 490 foreign banks and financial institutions, called for Venezuela to make a \$750m

principal payment at the time the restructuring officially becomes operational, scheduled for the end of 1988. After oil prices fell earlier this year, the Government had second thoughts about making the \$750m "down payment," thus jeopardising the restructuring accord. Now, however, it appears the administration of President Jaime Lusinchi intends to comply with the lump-sum payment. It is still not clear, though, whether the Government will ask banks for assistance in making this payment. Referring to some \$50bn in private sector debt that has recently caused concern among international bankers, Mr Marciano also said the Government may develop a plan for allowing repayment of these debts in instalments over a period of 31.2 years. He added, however, that a final decision on this matter must be made by the Venezuelan Cabinet.

S. Africa and Mozambique clash over Nkomati Accord

BY ANTHONY ROBINSON IN JOHANNESBURG

CHARGES AND counter charges are flowing again between South Africa and Mozambique over alleged infringements of key sections of the March 1984 Nkomati Accord under which Mozambique undertook to prevent the African National Congress (ANC) operating from the country and South Africa agreed to cease support for Mozambican National Resistance (MNR) rebels. South African security forces believe ANC guerrillas involved in planting landmines in the Eastern Transvaal have been moving through Swaziland from Mozambique while Mozambican sources allege that the MNR has received additional military supplies for their campaign to interrupt the road, rail and oil pipeline links between Zimbabwe and the port of Beira. Mozambican allegations that supplies have been airlifted to MNR rebels from South Africa meet the standard refusal of the South African authorities

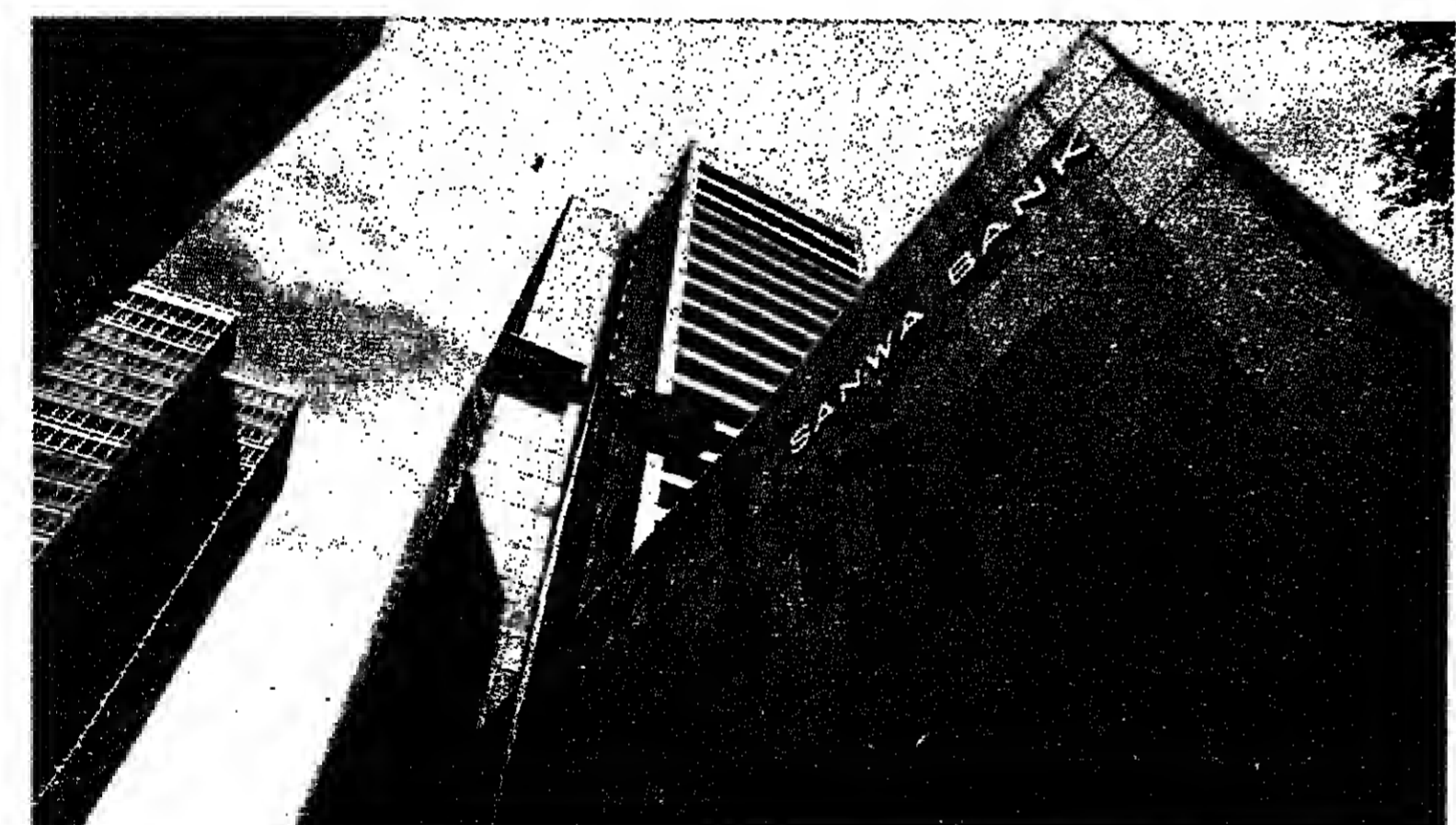
to either confirm or deny what they regard as "propaganda." Meanwhile in Angola Dr Jonas Savimbi, leader of the rebel Unita movement, told foreign correspondents that US military assistance over the past four months had helped to shift the balance of forces in Unita's favour in the long civil war with Cuban and Soviet-backed Angolan government Fapla forces. A 23-year-old black man was killed and eight injured yesterday when police fired birdshot at a crowd of 500 people who were stoning their vehicle, AP reports from Johannesburg. The clash occurred outside a high school in Johannesburg's main black township, according to the Bureau of Information, which said those injured ranged in age from 14 to 25. Earlier, the Bureau said a five-year-old black girl saalep in the home of a town councillor was killed by a hand grenade thrown through the window of her room.

All-out attack on Iraq urged

Iran's Parliamentary Speaker Ali Akbar Hashemi Rafsanjani has called for an all-out attack on Iraq to prevent Iran's Gulf war enemy from reorganising its forces, the Iranian news agency IRNA reported at the weekend. Reuter reports that Mr Rafsanjani told a Tehran seminar that Iraq should be given no chance to reorganise its forces and that Iran, "by launching an all-out attack, should deprive the enemy from carrying out its mischief." He denounced what he termed imperialist plots "to force the Islamic revolution to kneel down."

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OVERSEAS NEWS

Wheat producers assail EEC, US export subsidies

BY RICHARD HUBBARD IN CANBERRA

CANADA came under intense pressure to adopt the headline view of Australia and Argentina against agricultural subsidies by the US and the European Community at a special meeting of the three leading wheat exporting nations in Cairns, north-east Australia, yesterday.

Mr John Dawkins, the Australian Trade Minister, called on the EEC and the US to reduce and eventually remove production and export subsidies and forecast that the crisis facing international grain exporters was likely to deepen in the next few months.

The three nations together produce around 44 per cent of world wheat exports, with the US and European Community accounting for most of the rest.

After their meeting yesterday the three nations agreed that in the short-term production and release of surplus stocks to the export market by the US and EEC had to be restrained.

Mr Charles Mayer, the Canadian Minister placed the blame for the current wheat crisis firmly at the feet of the EEC. "The US is at least talking about reducing production," he said.

Mr Dawkins said the three nations rejected market sharing, as proposed by the EEC, as a long-term solution to the problem. "The obligation rests with those who have engaged in market subsidies and created the problem," Mr Dawkins said.

The three wheat exporters held preliminary discussions ahead of a 14-nation conference of agricultural trading nations due to begin discussions today. Brazil, Chile, Colombia, Fiji,

Hungary, Indonesia, Malaysia, New Zealand, the Philippines and Uruguay are also attending the conference, which aims to ensure that agriculture gains top priority at next month's General Agreement on Tariffs and Trade (GATT) talks at Punta del Este in Uruguay.

The conference was called by the Australian Government, which is facing severe balance of payments problems because of the erosion of export earnings due partly to the lower prices for leading agricultural products on world markets.

The Government has identified the subsidised trade war between the EEC and the Americans as one key cause of lower world prices for agriculture.

In his opening address to the conference, Mr Bob Hawke, the Australian Prime Minister, made a call for unity against the trading blocs of the US and the EEC, and warned that participants faced a long haul in changing the world trading system.

Mr Hawke said the EEC had countered Washington's offer with a better one.

The US announced this month that it was offering Moscow wheat with a \$13 a tonne subsidy.

EEC grain trade sources said Mr Dawkins might have been referring to an EEC committee decision to make available for export \$50,000 tonnes of soft wheat in store in the Community.

France speeds profit share legislation

By David Housen in Paris

THE FRENCH Government is bringing forward legislation to widen employee participation in both the management of industry and in the profits it makes.

Ministers met yesterday to finalise details of two decrees to be put before the Cabinet early next month which will reflect long-held Gaullist ideas on encouraging worker ownership and profit-sharing schemes in industry.

At the same time, in pushing forward the legislation now, the right-wing government of Mr Jacques Chirac, is anxious to show that it is no less progressive than the Socialists over labour issues.

The measure will be received a mixed welcome from trades unions—with the more left wing unions being reluctant to be drawn into co-responsibility for industrial management.

Of the two decrees, the first will allow worker representatives to have up to a third of the seats on company boards. The measure will be voluntary and at the initiative of companies. It requires the approval of a two-thirds majority in the general assembly.

The new law will replace and extend legislation brought in by the Socialists to "democratise" the public sector after the nationalisations of 1982. This law, which required nationalised companies to have work representatives on their boards, will progressively expire as companies are privatised.

The intention of the second decree is to go before the Cabinet is to simplify and broaden existing schemes with the emphasis on encouraging long term savings within a company.

The draft decree envisages increasing the amount that companies must set aside from profits for a reserve fund for employees.

Islamabad ponders what to do with Bhutto

BY JOHN ELLIOTT IN KARACHI

THE PAKISTAN Government is expected next week to decide what charges to bring against Miss Benazir Bhutto and other leaders of the country's political opposition, who were jailed nearly two weeks ago, when violent demonstrations swept through the country protesting against the ruling regime of President Zia ul-Haq.

Calm has now been restored throughout the country and there have been no big demonstrations over the weekend, although a growing problem of armed attacks by handits is continuing to disrupt the southern province of Sindh, which was at the centre of the political protests and is now being patrolled by the army.

Tension has eased in the southern city of Karachi, the country's commercial centre and the capital of Sindh, where there were major riots which caused concern among the business community.

In an interview yesterday, Mr Syed Ghous Ali Shah, Sindh's chief minister, denied reports that charges for the capital crime of sedition and treason had been filed against Miss Bhutto, whose father, President Zulfikar Ali Bhutto, was executed in 1979. She now leads the Pakistan People's Party, and is trying to force the Government to call early elec-



President Zia ul-Haq

tion. Mr Shah said that "a lot of reports" had been filed against various groups of people for charges including murder, which in Pakistan carries a penalty of hanging. But "her names does not appear because she was not on the spot."

He added that she "could be linked if people who have been named implicate her" and added: "If evidence comes against her, she will not be an exception—she will be treated the same as everyone else."

However, it seems unlikely that President Zia will want to upset the country's political stability by making her a martyr. Her present 30 days of detention expires in two weeks' time.

President Zia returned to Pakistan on Saturday from Saudi Arabia, where he had on a two-week Moslem pilgrimage, missing the crisis that erupted after processions and meetings were banned on Pakistan's August 14 independence

day by Mr Mohammed Khan Junejo, the Prime Minister. President Zia, who does not appear to have suffered politically as a result of the crisis, reviewed the political and security situation with senior officials. Mr Junejo, whose credibility has taken a knock, has started meeting members of Pakistan's parliament in individual states in an attempt to build a political consensus for the action to be ordered against the demonstrations, which built up into Pakistan's most serious outbreak of violence since an uprising in Sindh in 1983.

Estimates of those killed range from official figures of 20 to over 40 and more than 2,000 people are believed to have been arrested. Mr Shah said only 85 were still being held in Sindh.

The tough army action in Sindh, coupled with a more relaxed regime in the Punjab after four people were killed at the beginning of the demonstra-

tions, in effect squashed the attempts by Miss Bhutto's party to mount a big offensive against the Government.

The party had intended to launch this offensive, possibly including some civil disobedience and disruption of communications from September 20. But it decided to bring this forward to August 14 as a response to Mr Junejo's ban on independence day meetings.

That played into the hands of the Government, which wanted to deflect the opposition away from the September 20 target. Political activists in the Punjab failed to support demonstrations in the Sindh and this led to the campaign collapsing because no alternative organisation or system of communication had been prepared to take over when the top leaders were put in jail.

Miss Bhutto's credibility as a political leader has consequently suffered, but she is expected to continue to have considerable personal appeal

Indonesia and Philippines plan common market

INDONESIA and the Philippines agreed yesterday to work towards creating a Southeast Asian common market by the year 2000. Philippine Minister of Trade and Industry Jose Concepcion said, Renter reports from Jakarta.

The idea was discussed at wide-ranging political and economic talks between the two countries while Philippine President Corason Aquino was holding separate talks with President Suharto.

The political discussions focused on the Kampuchean conflict. Soviet leader Mikhail Gorbachev's Asian policy speech last month and border issues between the neighbours.

Mr Concepcion said the two countries agreed on a vision of

creating a common market among the six members of the Association of South East Asian Nations (Asean).

The grouping, which links Indonesia and the Philippines with Thailand, Singapore, Malaysia and Brunei, will hammer out the common market plan at an Asean summit meeting next July in Manila, he said.

The idea was being pushed especially by the Philippines and Thailand with support from Malaysia and would figure prominently in Mrs Aquino's talks with Singapore Prime Minister Lee Kuan Yew tomorrow.

Mr Concepcion said Indonesia suggested that Asean should move gradually toward a common market over the next 14

years through a series of "intermediate steps."

"We have to review the entire spectrum of trade, finance and currency policies in evolving a zero-duty common market in the next 14 years."

Products which now had high import tariffs would be gradually taken off the preferential list until the vision of a duty-free system is achieved

Test freeze gives US advantages, says Moscow

THE chief of staff of the Soviet armed forces, Marshal Sergei Akhromeyev, said yesterday Moscow's nuclear test moratorium had given the US some advantages but had not altered the East-West military balance. Renter reports from Moscow.

Mr Akhromeyev said the Kremlin's civilian leadership had decided to extend the test freeze until January 1 because the political benefits outweighed the costs to the Soviet

nuclear programme. "We had to accept a certain damage to ourselves, but we took into account that this damage was tolerable," Mr Akhromeyev told a news conference.

"The US had" conducted 18 nuclear tests since the Soviet moratorium took effect, including three unannounced low-yield tests in August 1985, autumn 1985 and spring 1986, he said. The test freeze began on August 6 last year.

US considers short-term help for Bolivia

By Peter Montagnon, Euromarkets Correspondent, in London

THE US Treasury is considering short-term financial assistance to Bolivia which is facing an acute shortage of foreign exchange, exacerbated by its recent crackdown on the narcotics trade.

The move, announced last week, is likely to be seen as further evidence that the so-called Baker Plan to ease the developing countries' debt crises is finally being implemented. The plan was launched by the US at the International Monetary Fund meeting in Seoul last year.

The Treasury's statement, which gave no figure for any likely loan, praised Bolivia for its efforts in reducing inflation which has been cut dramatically, to 50 per cent in the first six months of this year from 8,000 per cent last year.

Commercial bankers who have been working on Bolivia's \$3bn foreign debt said the Treasury move was an unexpected one which suggested it could also be designed as an incentive to Bolivia for its action on the drugs front.

They said such short-term financial assistance was normally only granted to countries with much larger foreign debts, such as Mexico, in the immediate aftermath of an economic policy agreement with the IMF.

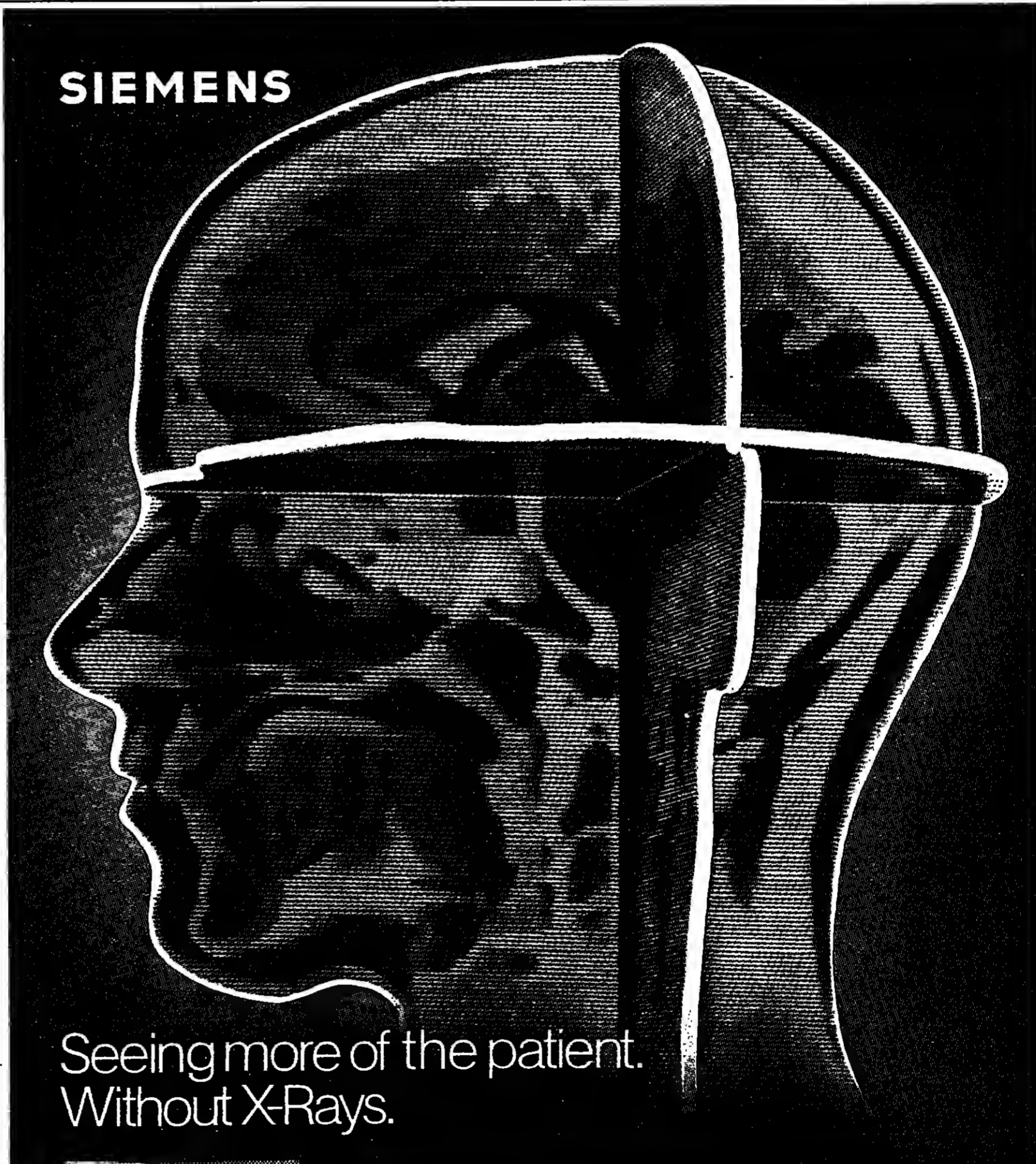
It was also unusual for the US to consider a bridging loan without determining clearly how its loan was going to be repaid, they said.

Five die in Cote d'Azur forest fires

FIRES THAT have ravaged the pine and mimosa-clad hills above the French Cote d'Azur over the past three days seemed to be losing momentum last night, reports our Paris staff.

Five people were killed and 8,500 hectares of hillside burnt in a second wave of forest fires which has hit the South of France this year. Local officials suspect that some of the fires were deliberately started. A young West German tourist arrested yesterday on charges of starting a fire, admitted he had tried to start another the day before in the hope that cars would halt and give him a lift.

Most damaged were the hillsides between Cannes and Caprais where the flames destroyed 7,000 hectares of pine forest and scrub land, including wild mimosa. In the wake of the worst drought the South of France has known for 30 years the flames spread at lightning speed. Over 2,900 hectares around Lausanne above Nice were also burnt.



Seeing more of the patient. Without X-Rays.

The European Banking Traded Currency Fund Limited

NOTICE of the SECOND ANNUAL GENERAL MEETING of Shareholders to take place on the 26th day of September, 1986 at 11 am.

NOTICE is hereby given pursuant to the Articles of Association of The European Banking Traded Currency Fund Limited ("the Company") that the Second Annual General Meeting of the Company will take place on the 26th day of September, 1986 at 11 am at EBC House, 1-3 Seale Street, St. Helier, Jersey, Channel Islands for the purposes of considering and if thought fit, passing the following Ordinary Resolutions:

Resolutions

- That the Financial Statements for the period ended 31st March, 1986 together with the Report of the Directors and the Auditors thereon be received, approved and adopted.
- That Messrs. Coopers & Lybrand who have signified their willingness to continue in office be and are hereby appointed the Auditors of the Company for the ensuing year and that the fee payable to them in respect of the year to 31st March, 1987 be determined by the Directors.

By order of the Board
EBC Trust Company (Jersey) Limited
Secretary

Dated the 18th day of August, 1986.

NOTES

- The holder of a Continental Depository Receipt ("CDR") may exercise his voting rights by depositing the CDR at the office of Amsterdam Depository Company N.V., 172 Spuistraat, 1012 VT Amsterdam, The Netherlands (the "Depository") and by instructing the Depository as to the exercise of the voting rights attached to the Shares evidenced by such CDR, in the absence of such instructions, the Depository will exercise such voting rights or refrain from doing so, as it thinks fit in the interests of the holder.
- There are no service contracts with the Directors.

crédit foncier de france

¥ 15,000,000,000

Guaranteed Floating Rate Notes Due 1997
For the six months
27th August 1986 to 27th February 1987

In accordance with the provisions of the Notes, notice is hereby given that the rate of interest has been fixed at 4 1/2 per cent per annum, and that the interest payable on the Interest Payment Date 27th February, 1987 against Coupon No. 3 will be:
¥ 24,278 per ¥ 1,000,000 and ¥ 242,778 per ¥ 10,000,000.

The Industrial Bank of Japan, Limited - Agent Bank

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OVERSEAS NEWS

Tan admits guilt to Pan-Electric collapse charge

BY WONG SULONG IN KUALA LUMPUR

MR TAN KOON SWAN, the prominent Malaysian businessman and politician, yesterday pleaded guilty in the Singapore high court to an amended charge of abetment in criminal breach of trust related to the collapse of Pan-Electric Industries, the Singapore marine salvage, engineering and hotel group.



Mr Tan: still face 14 possible charges

asked the court not to jail him, but "to impose a fine of a very substantial amount consistent with the gravity of the offence."

Korean succession strengthened

BY STEVEN B. BUTLER IN SEOUL

A SWEEPING shake-up in the leadership of South Korea's ruling Democratic Justice Party (DJP), announced at the weekend, has strengthened the position of Mr Roh Tae-woo, the party chairman, as heir-apparent to the Korean President.

A draft constitution presented to parliament today by South Korea's ruling party would include a provision to elect the president from among the members of the party.

The shakeup was also designed to improve the party's public image as it negotiates with the Opposition over constitutional reform.

WORLD TRADE NEWS

Christian Tyler reports on selling power stations to customers who cannot afford them Power engineers fight credit war for exports

THERE IS a new kind of engineer in the power plant industry these days. He wears a pinstriped suit and spends most of his time in banking parlours dreaming up sophisticated loan packages.

ness, NEI Parsons (formerly C. A. Parsons) on Tyneside, had a feast of home orders during the 1980s. With customers queuing at the gate, traditional export markets, such as Australia and Canada, were left unattended, and new competitors, especially the Japanese, walked in.



Mr Anderson: 12 months to get a commitment

World-class design, computerised production and tireless salesmanship are no longer enough in a buyers' market, where delivery times have halved in the past decade.

A £70m programme of investment was launched in 1980. In the first five years, £40m were spent, mainly on re-equipping the turbine generator shop with computer-controlled lathes.

All this has been accompanied by what Mr Richard Maudslay, the 59-year-old managing director of Parsons, calls "a ruthless re-examination of all the overhead costs."

"No longer do we sell on the basis of the excellence of our plant, or its reliability — all the things a good engineer thinks of. Unless we are able to match the finance offered by our competitors, the customer will not buy from us, however superior the equipment is."

Computer-aided design was introduced to help engineers refine the shape of turbine blades for maximum efficiency, to standardise component manufacture, and to piece together on television screens the complicated layouts of the modern power station.

The company's persistence was rewarded with four orders in new markets in recent years. It was chosen in a consortium with Klockner of West Germany to build the Jacul power station in Brazil, beat the Japanese to an order in Singapore — "their own backyard" — has supplied

three units to Botswana and is sub-contractor to Hyundai of South Korea for the Al Mussabih power station in Iraq.

tractors, such as NEI, have put such pressure on their own Government to sharpen its responses to international credit competition. Mr Anderson, the deputy chairman, was one of those who lobbied for the recently-announced £300m soft loan facility for China.

EXPORTS LIKELY IN DECEMBER

Iran 'to resume Soviet gas sales'

IRAN EXPECTS to resume natural gas exports to the Soviet Union this year for the first time in more than six years, the national news agency Irna said yesterday, Reuter reports from Tehran.

The resumption of gas exports when he visited Moscow last week.

and was unlikely to be able to take its former daily average throughput of 25m cubic metres.

It did not say agreement had been reached with Moscow, but predicted that exports would start at a rate of 3m cubic metres per day in December, and rise to 80m or 90m cubic metres per day by March 1990. It did not mention prices.

Exports were suspended in early 1980 after Moscow had rejected demands by the new Islamic revolutionary government in Tehran for a substantial price increase.

Mr Maudslay says: "Until the late 1970s, we were suffering from what people used to call the British disease. But in the last 15 months we have come in the top three in our bids for contracts."

Mahathir and Lee agree over gas and water

By Wong Sulong in Kuala Lumpur

A BREAKTHROUGH has been achieved in talks for the long-term supply of natural gas and water to Singapore by Mr Mahathir, following a meeting here over the weekend between Dr Mahathir Mohamad, the Malaysian Prime Minister, and his Singapore counterpart, Mr Lee Kuan Yew.

SHIPPING REPORT

Markets more cheerful

By Andrew Fisher, Shipping Correspondent

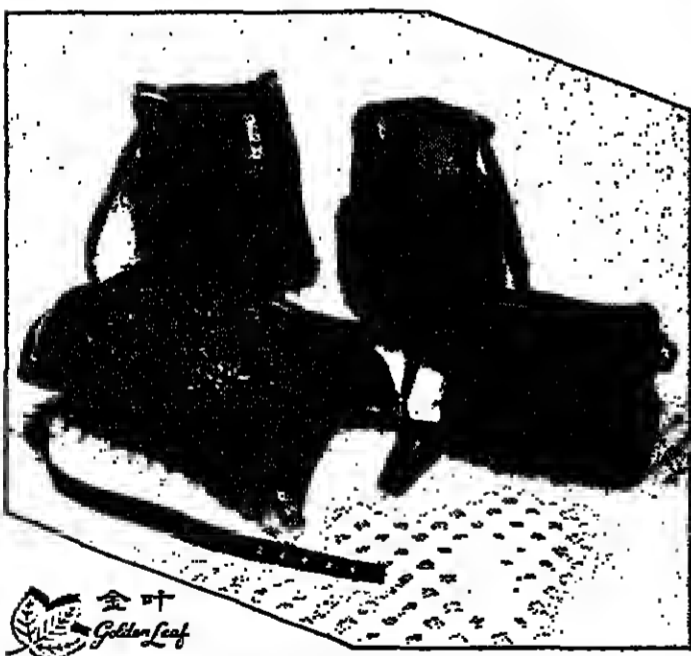
THE TONE in shipping markets was cheerful last week, with rates finally moving ahead on the dry cargo market and continuing to be firmer for tankers.

Denholm Coates, the UK shipbroker said: "A marginally brighter light has dawned" for dry cargo vessels. The rate for grain from the Gulf of Mexico to Japan was firmer at \$8.95 a ton for early shipments and around \$9.30 for October, November and December.

Production curbs imposed by the Organisation of Petroleum Exporting Countries (Opec) could again limit tanker activity, though Galbraith's, the London shipbroking firm, said ship-owners generally remained optimistic about prospects for large vessels.

中國安徽

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World Economic Indicators

Table with columns for Industrial Production (1980=100) and % change over previous year for various countries (US, UK, W. Germany, France, Netherlands, Japan) from July '86 to May '85.

Burlington Industries, Inc. advertisement for 7% Convertible Subordinated Debentures Due 2001, listing various financial institutions and a total value of U.S. \$75,000,000.

WORLD CAR MARKETS

UNITED STATES				JAPAN				WEST GERMANY				UK			
1985		January-June 1986		1985		January-June 1986		1985		January-June 1986		1985		January-June 1986	
Domestic	Imports	%	%	Domestic	Imports	%	%	Domestic	Imports	%	%	Domestic	Imports	%	%
2,436,247	4,136,967	36.2	41.3	1,547,227	1,571,451	49.6	50.0	874,682	1,256,697	40.9	41.0	369,539	343,636	51.8	51.8
1,881,572	1,881,572	77.2	77.2	1,547,227	1,571,451	49.6	50.0	874,682	1,256,697	40.9	41.0	369,539	343,636	51.8	51.8
654,675	5,216,969	12.5	23.3	24,224	1,571,451	1.5	2.0	382,015	1,256,697	30.4	30.4	170,263	343,636	49.6	49.6
5,216,969	5,216,969	100.0	100.0	1,595,675	1,595,675	100.0	100.0	1,256,697	1,256,697	100.0	100.0	343,636	343,636	100.0	100.0

Customers in the US re-discover the 'cheapie'

By Kenneth Gooding, Motor Industry Correspondent

THE SUCCESS of Hyundai, the South Korean car maker, in the US this year is remarkable, even by the standards of the volatile American market. US customers re-discovered cheap new cars and helped Hyundai take nearly 1 per cent of their market in the first six months. Thus the company is well on the way to its target of selling 100,000 cars in its first full year in the States.

By the end of June Hyundai had sold more than 52,000 of the small, front-wheel-drive Excel models which in basic form have a list price of \$4,995 compared with the average \$12,000 Americans pay for a new car or the average \$5,400 for a used car.

Hyundai's timing was fortuitous. The Japanese car makers who once dominated the cheaper end have been moving up-market now they can no longer look for big volume growth in the US.

When Hyundai announced last year it would launch in the US this year, one new car dealer in every 10 applied for the franchise.

Dealers had in mind the fortunes made by some colleagues who got in on the ground floor when the Japanese groups first started tackling the US car market. They also knew about Hyundai's phenomenal success in Canada where it was able to take advantage of the restric-

tions on Japanese cars to become the leading importer in the short space of about 18 months.

All this interest enabled Hyundai to put together very quickly a formidable dealer network.

The Japanese were not left completely out in the cold by the emergence of the demand for really cheap new cars in the US. To start with, Mitsubishi owns 15 per cent of Hyundai and supplies the Korean company with a great deal of technology under licence.

Mitsubishi also intends to sell a version of the Excel through its own dealers in the States.

General Motors, which dominates the US car market, is importing small cars from its Japanese associates, Isuzu and Suzuki, and selling them at rock-bottom prices through its Chevrolet dealer network as the Spectrum and Sprint.

In the first half of this year GM sold 49,700 Isuzu-built vehicles up from 29,000 in the same months of 1985, and 35,700 Suzuki-produced Sprints, up from 8,600.

By those standards, the other new "cheapie," the Yugo, launched with a base price of \$3,990 late last year by an independent importer from the state-owned Zastava company in Yugoslavia, had a relatively

modest first-half with sales of 11,940.

Some forecasters predict sales of cars with a price of under \$5,000 could reach 1m a year in the US before long.

With this in mind, Chrysler has introduced Omni/Horizon America models at \$5,499 and GM is considering launching a version of its old Chevrolet Chevette at \$4,995.

GM has also lined up another South Korean import for 1988 which will be built by its Daewoo associate there and sold in the US with the Pontiac badge.

Not to be left out, Ford has bought 10 per cent of South Korea's Kia company for \$30m and intends to import into the US a Kia model to be sold as the Ford Festiva.

Meanwhile, the Japanese still make progress in the US. In the first half of this year sales of cars imported from Japan moved up from just over 1m in the same months of 1985 to about 1.1m.

However, the big three, Toyota, Nissan and Honda, gave up some volume to make way for those "captive" imports by GM from Isuzu and Suzuki, and for substantial increases by Mazda and Subaru.

When made-in-America cars are taken into account, Honda has been firmly established as the top-selling Japanese marque in the US and sells nearly twice as many cars in the States as in Japan.

Buoyed by major cheap-finance incentives for customers, total US car sales in the first half of this year improved marginally, by 0.3 per cent, compared with the January-June period of 1985; to 5.65m.

However, while imports rose by 14.5 per cent, sales of US-built cars fell by more than 4 per cent. Only Honda, with no 11.3 per cent rise in US-made cars, and Nissan, among the US producers showed an improvement on the first half of 1985. Nissan's 248 per cent climb reflects the fact that it began to sell cars from its factory only in the spring of last year.

Among the other US manufacturers, GM suffered a 2.57 per cent sales decline. Ford was down nearly 7 per cent, Volkswagen more than 2 per cent from an already very low base and American Motors, controlled by Renault, saw sales of US-built cars drop by nearly 44 per cent.

The world's other major car markets all experienced volume

improvements in the first half of this year. In Japan, still in the grip of a vicious price war as Nissan, the second-largest group, attempted to claw back ground lost to Toyota, the biggest company, the market improved by 3 per cent compared with the first six months of 1985.

The gap between Toyota and Nissan widened in the half-year while Honda continued to catch up with both of them.

Toyota also is now neck and neck with Nissan in Western Europe where thanks mainly to its UK importer which sells about 100,000 cars a year, Nissan so far has held the lead.

Between them the Japanese boosted their share of Western European car sales from 10.4 per cent to a record 11.6 per cent.

While total West European registrations grew by 8.3 per cent to 6.16m in the half-year, Japanese sales in the 17 major European car markets jumped by 22.9 per cent, taking over one quarter of the 472,000 extra sales.

Much of the Japanese gain was made in West Germany, the biggest European market. In the first six months its share of German sales increased from 13 per cent to 14.5 per cent following a 31 per cent advance in volume, from 163,400 to 214,600—equivalent to the annual output of an average-size car plant.

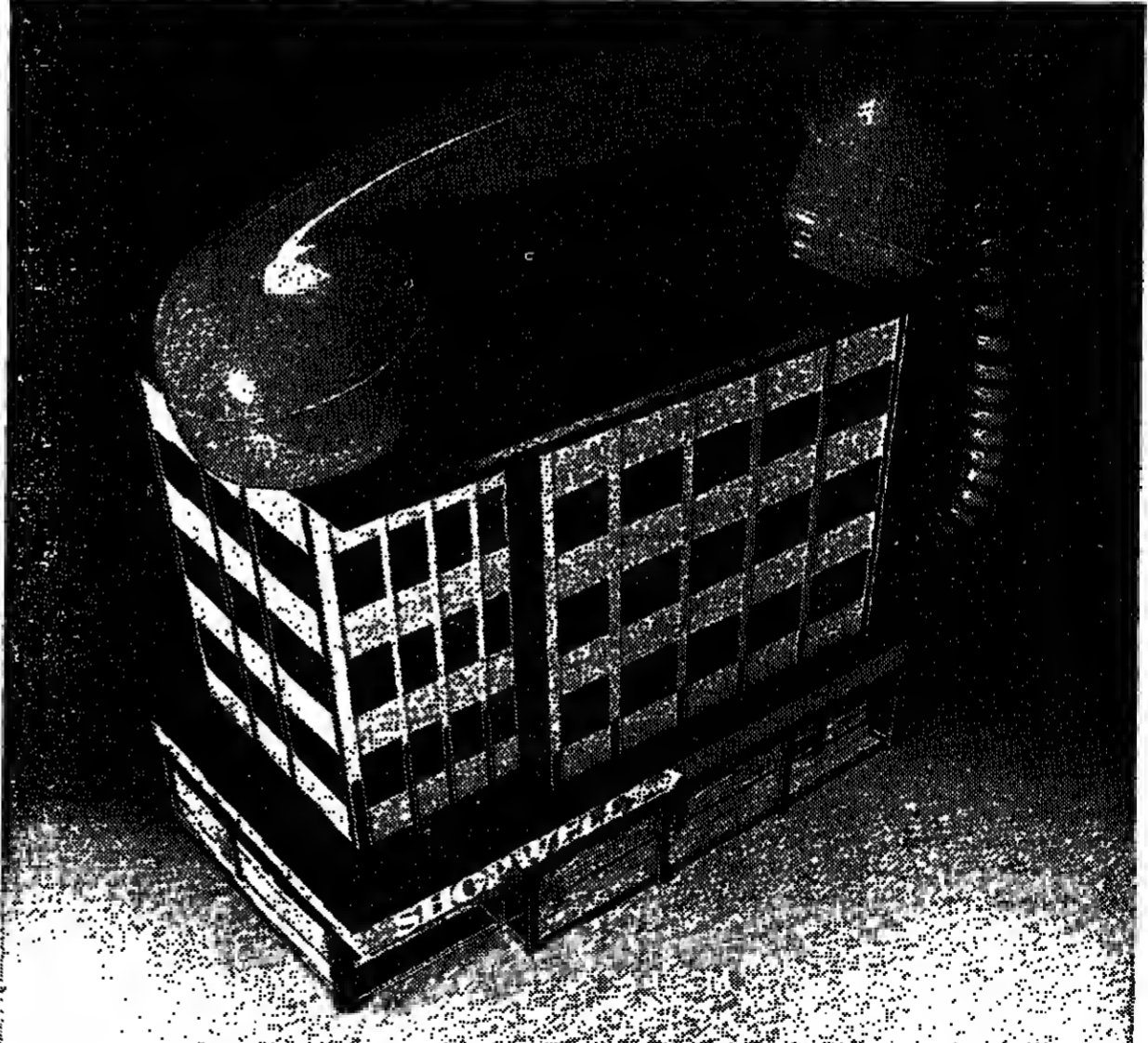
Of the European companies, Volkswagen - Audi, having acquired Saab from the Spanish Government, has opened up a considerable lead to the sales league table. VW's share of European registrations was 14.6 per cent (14.5 per cent in the first half of 1985) against Fiat's 13 per cent (12.8 per cent), Ford's 11.6 per cent (11.7 per cent), General Motors' 11.4 per cent (11.6 per cent), Peugeot-Citroen-Talbot's 11.2 per cent (11.4 per cent) and Renault's 9.9 per cent (10.9 per cent).

Another feature of the six months was the continued strong advance of Daimler-Benz, West Germany's Mercedes car maker, based on the intro-

FRANCE			
1985		January-June 1986	
Domestic	Imports	%	%
584,598	311,233	65.23	34.77
895,831	895,831	100.00	100.00
DOMESTIC			
Peugeot-Talbot	198,218	22.24	198,218
Chrysler	116,935	13.05	116,935
Total Peugeot group	315,153	35.29	315,153
Renault	268,430	29.96	268,430
LEADING IMPORTERS			
Volkswagen-Audi	66,274	7.40	71,990
Ford	67,728	7.56	67,979
Fiat	42,977	4.70	55,099
General Motors-Opel	41,657	4.65	46,349

ITALY			
1985		January-June 1986	
Domestic	Imports	%	%
599,679	393,131	69.40	30.60
992,810	992,810	100.00	100.00
DOMESTIC			
Fiat/Lancia/Autobianchi	522,141	52.60	522,141
Alfa Romeo	64,828	6.50	64,828
LEADING IMPORTERS			
Renault	104,423	10.50	84,770
Volkswagen-Audi	78,285	7.90	81,944
Peugeot/Citroen/Talbot	69,642	7.00	74,166
Ford	41,002	4.10	40,106
General Motors-Opel	28,118	2.80	32,824

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Notice of Redemption and Expiration of Conversion Rights to Holders of

Miles International Inc.

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(Guaranteed by Miles Laboratories, Inc.)

YOU ARE HEREBY NOTIFIED, pursuant to Section 4.04 of the Indenture dated as of June 15, 1968 (the "Indenture"), among Miles International Inc., a Delaware corporation (Miles International), Miles Laboratories, Inc., a Delaware corporation (successor by merger to Miles Laboratories, Inc., an Indiana corporation) ("Miles") and Citibank, N.A. (under its former name First National City Bank), as trustee (the "Trustee"), providing for the issue of the above-described Debentures (the "Debentures"), as amended and supplemented by the provisions of the First Supplemental Indenture dated as of January 8, 1979 (the "Supplemental Indenture"), among Miles International, Miles (under its former name Rhinchem Laboratories, Inc.) and the Trustee, that Miles International has called all of the Debentures for redemption on October 1, 1986 (the "Redemption Date"). The Debentures will be redeemed at 100.25% of the principal amount thereof plus accrued interest to the Redemption Date (the "Redemption Price") aggregating a total of U.S. \$1,016.35 for each U.S. \$1,000 principal amount of Debentures redeemed.

The Debentures will become due and payable and, upon presentation and surrender thereof (with all coupons appertaining thereto maturing after October 1, 1986), will be paid at the Redemption Price on the Redemption Date, at the option of the holder, (a) at Citibank, N.A., Bond Redemption Department, 5th Floor, 111 Wall Street, New York, New York 10043, or (b) subject to applicable laws and regulations, at the main offices of the Trustee in London (City Office), Brussels, Paris, Amsterdam, Frankfurt/Main and Milan or the main office of Banque Generale du Luxembourg S.A. in Luxembourg. Payments at the offices referred to in (b) above shall be made by a check drawn on a bank in New York City or by transfer to a dollar account maintained by the payee with a bank in New York City. On and after the Redemption Date interest on the Debentures will cease to accrue.

As an alternative, pursuant to the provisions of Section 3 of the Supplemental Indenture, each U.S. \$1,000 principal amount of Debentures may be converted, at the option of the holder thereof, into the fixed amount of U.S. \$738.11 in cash (the "Conversion Price") by delivery of the Debentures (with all coupons appertaining thereto maturing after October 1, 1986) to any of the above offices, accompanied by written notice that the holder thereof elects to convert the Debentures. As promptly as practicable after the receipt of such notice and such delivery of such Debentures and coupons, there shall be delivered at said office to such holder, or on his written order, a cash payment as specified above. At the close of business on the Redemption Date such conversion rights will terminate.

Holder of Debentures should note that the Redemption Price is larger than the Conversion Price.

August 19, 1986

Miles International Inc.

NOTICE

Any payment made upon the redemption or conversion of the Debentures in the United States or by transfer to a dollar account maintained by the payee with a bank in New York City may be subject to reporting to the United States Internal Revenue Service (IRS) and to backup withholding at a rate of 20% if payee not recognized as exempt recipient from the paying agency under an executed IRS Form W-8, certifying under penalties of perjury that the payee is not a United States person or an executed IRS Form W-9, certifying under penalties of perjury that the payee's taxpayer identification number (employer identification number or social security number, as appropriate). Those holders who are required to provide their correct taxpayer identification number on Internal Revenue Service Form W-9 and who fail to do so may also be subject to a penalty of \$50. Please therefore provide the appropriate certification when presenting your Debentures for redemption or conversion.

UK NEWS

Joan Gray reports on one aspect of the City revolution
Big Bang boom for builders

FROM a road junction close to the Financial Times' offices in the City of London, it is possible to see six office blocks covered with scaffolding; behind rise three tower cranes on the site that will be the Royal Bank of Canada's new offices; nearby, the second largest tower crane in Europe is at work on the stock exchange.

The space over and around Liverpool Street Station is already being transformed into a financial centre in a £300m scheme which is the largest building project in the City since the rebuilding which followed the Great Fire of London in 1666.

Just how well they are doing can be seen from a survey of the most important office building projects in the City carried out by the trade magazine Construction News. The 24 major projects for which it could quote prices added up to work worth more than £530m for the contractors.

comes directly from contracts linked to the Big Bang. One Arup's workload in the Square Mile has risen from 40 projects with a value of £50m last year to 69 projects worth £100m this year.

Aid sought for black S. African school plan

By Hazel Duffy
BRITISH industrialists with interests in South Africa are seeking support for a scheme to provide education in British, German and US universities for about 2,000 South African blacks and coloureds.

NOTICE OF REDEMPTION

To the Holders of
R. J. REYNOLDS OVERSEAS FINANCE CO. N.V.

12 3/4% Guaranteed Notes, Due October 1, 1989
Unconditionally Guaranteed by RJR Nabisco, Inc. (formerly R. J. Reynolds Industries, Inc.)

NOTICE IS HEREBY GIVEN that, pursuant to the provisions of Paragraph 6 of the Fiscal Agency Agreement dated as of September 23, 1982, among R. J. Reynolds Overseas Finance Co. N.V. (the "Company"), as Issuer, RJR Nabisco, Inc., as Guarantor, and Morgan Guaranty Trust Company of New York, as Fiscal Agent, all of the Company's 12 3/4% Guaranteed Notes, Due October 1, 1989 (the "Notes") presently outstanding will be redeemed on October 1, 1986 (the "Redemption Date") at a redemption price ("Redemption Price") of 101% of the principal amount thereof.

All interest coupons which shall have matured on or prior to October 1, 1986 should be presented for payment in the usual manner. The Notes will no longer be outstanding after the Redemption Date and interest on the Notes will cease to accrue from and after the Redemption Date and the coupons for such interest will be void.

R. J. REYNOLDS OVERSEAS FINANCE CO. N.V.
By: Morgan Guaranty Trust Company of New York, as Fiscal Agent

Dated: August 26, 1986

NOTICE OF REDEMPTION

To the Holders of
COCA-COLA INTERNATIONAL FINANCE N.V.

11 3/4% Guaranteed Notes due 1989

NOTICE IS HEREBY GIVEN to the holders of the outstanding 11 3/4% Guaranteed Notes due 1989 of Coca-Cola International Finance N.V. (the "Company") that, pursuant to the provisions of Section 6 of the Fiscal and Paying Agency Agreement dated as of October 1, 1982 among the Company, The Coca-Cola Company (the "Guarantor"), and Morgan Guaranty Trust Company of New York (the "Fiscal Agent") and Paragraph 5 of the Terms and Conditions of the Notes, the Company has elected to redeem on October 1, 1986 all of its outstanding Notes at a redemption price of 101 1/2% of the principal amount thereof plus accrued interest to the redemption date.

Payments will be made on and after October 1, 1986 against presentation and surrender of Notes with coupons due October 1, 1987, and subsequent coupons attached in U.S. dollars subject to applicable laws and regulations, either (a) at the office of the Fiscal Agent in New York City, or (b) at the main offices of the Fiscal Agent in London, Brussels and Frankfurt, Swiss Bank Corporation in Basle and Zurich, and Banque Generale de Luxembourg in Luxembourg. Payments at the offices referred to in (b) above will be made by check drawn on a dollar account maintained outside the United States and its possessions or by transfer from a dollar account maintained outside the United States and its possessions to a dollar account maintained by the payee outside the United States and its possessions.

Coupons due October 1, 1986 should be detached and collected in the usual manner. From and after October 1, 1986 the Notes will no longer be outstanding and interest thereon shall cease to accrue.

COCA-COLA INTERNATIONAL FINANCE N.V.

Dated: August 26, 1986

FT COMMERCIAL LAW REPORTS

Digest of cases reported in the Trinity Term

In re A. V. Sarge & Co Ltd (FT, July 21)
In December 1982, the company appointed Mr Ashworth its voluntary liquidator. He was displaced some 16 months later by a compulsory winding-up order amid allegations that he had dissipated the company's assets. In dismissing a motion to discharge the registrar's order regarding Mr Ashworth's remuneration, Mr Justice Hoffmann stated that persons involved in the affairs of an insolvent company owed a public duty to assist the liquidator to investigate the company's affairs in the interests of creditors. That duty was particularly strong in the case of those closely involved in the conduct of the company's business. The registrar's order was not oppressive, vexatious or unfair, and should be upheld.

Appeal awarded the buyers \$45,853 demurrage. In allowing the sellers' appeal, Mr Justice Staughton stated that "time to count as per Centrocon charterparty" referred to all provisions as to when time should not count, including clause 30 which was the material clause. "Obstructions" in the clause covered congestion in a port and was not less apt to cover ordinary than extraordinary congestion.

South Carolina Insurance Co v Assaranté Maatschappij "De Zeven Provinciën" NV; South Carolina Insurance Co v Al Abia Insurance Co and Another (FT, August 1). International edition, August 5)
In upholding injunctions against the defendants restraining them from obtaining discovery of documents abroad, the Court of Appeal based its decision on three grounds, viz: (1) that the English court should retain control of its own process; (2) that the US civil procedure was markedly different and the parties should be regarded as having accepted English procedure when they submitted to local jurisdiction; and (3) that the issue was of considerable practical importance since there were conflicting decisions between London maritime arbitrators. The charterers, who had been held liable unsuccessfully applied to the High Court for leave to appeal on a question of law, and, upon refusal of their application, for leave to appeal to the Court of Appeal. Where there were conflicting decisions by arbitrators, a judge should give favourable consideration to granting leave to appeal to the High Court in order to provide a binding decision. The Court of Appeal stated in refusing the charterers leave to appeal from the High Court decisions. However, the judge's refusal did not of itself constitute a failure to exercise his discretion judicially.

In 1971, while laying ducts for the Post Office, contractors damaged two underground cables belonging to the plaintiff. The damage was made good in 1978. A writ was issued in 1978 pursuant to section 26 of the Public Utilities Act 1950 that compensation was payable "equal to expense, reasonably incurred." The Court of Appeal held that the action was statute-barred as time had begun to run from the date of the damage and not from the date of the repair. In overruling this decision, the House of Lords stated that if an enactment gave a right to recover expenses, the cause of action accrued only when the expenses were incurred, notwithstanding that the same event might have given rise to a different cause of action under statute or common law, accruing at some earlier date.

giving the majority shareholders the statutory power to remove the minority shareholder as director and entitling them to buy his shares at fair value. The petitioner, who had made no attempt to use the machinery in determining the fair value of his shareholding, should not be entitled to complain of unfair conduct in the circumstances and his petition should be struck out.

NOTICE OF EARLY REDEMPTION

ORIENT LEASING CO., LTD.
US\$50,000,000 5 1/4% Convertible Bonds 1998 ("BONDS")

Notice is hereby given that in accordance with Condition 6(b) of the Terms and Conditions of the Bonds, the Company will redeem all of the outstanding Bonds at 104 1/4% per cent of their principal amount on September 26, 1986 when interest on the Bonds will cease to accrue.

On September 26, 1986 the redemption price of 104 1/4% per cent will become due and payable upon each Bond to be redeemed, together with accrued interest from September 30, 1985 amounting to US\$258,85 per US\$50,000 Bond.

The right to convert the Bonds into fully paid shares of the Company will terminate on September 26, 1986, the date fixed for redemption. Bonds surrendered for conversion will not be entitled to accrued interest and shall be accompanied by the September 30, 1986 coupon and all coupons maturing thereafter. Bonds for conversion should be deposited in accordance with Condition 6(b)(ii) at the offices of the Conversion Agents specified on the Bonds or any other offices thereof changed and notified to the Bondholders, on or before September 26, 1986. The Bonds are presently convertible into fully paid shares of the Company at the price of Yen 2,960 per share. At such conversion price the holder of US\$5,000 principal amount of Bonds would receive 420 shares of the Company (using the fixed exchange rate specified in the Conditions of Yen 2,400.00 equals US\$1). The reported closing price on August 18, 1986 of the shares of the Company on the Tokyo Stock Exchange was Yen 4,400 per share. At such a price, the holder of a Bond of US\$5,000 principal amount would receive upon conversion 420 shares having an aggregate value of Yen 1,848,000. The aggregate principal amount of the Bonds outstanding as at the closing of August 19, 1986 was US\$44,315,000.

Failure to deposit Bonds for conversion on or before September 26, 1986 will automatically result in redemption at a price including premium and accrued interest of US\$5,433.85 for each US\$5,000 principal amount of Bonds. Payment of the redemption price will be made upon presentation of the Bonds with all unremitted Coupons appertaining thereto at the Offices of any one of the Paying Agents mentioned therein or any other offices thereof changed and notified to the Bondholders.

ORIENT LEASING CO., LTD.
By: THE CHASE MANHATTAN BANK, N.A.
London, Principal Paying Agent
August 26, 1986

Morgan Grenfell Group plc
Incorporated with limited liability in England under the Companies Act 1948 to 1987
U.S. \$200,000,000
Undated Primary Capital
Floating Rate Notes
In accordance with the provisions of the Notes, notice is hereby given that for the Interest Period from 26th August, 1986 to 26th February, 1987 the Rate of Interest will be 6 1/4% per annum.
The interest payable on the relevant Interest Payment Date, 26th February, 1987, will be US\$332.22 for each US\$10,000 Note and US\$3,305.56 for each US\$250,000 Note.
Agent Bank:
Morgan Guaranty Trust Company of New York
London

NOTICE OF EARLY REDEMPTION
ORIENT LEASING CO., LTD.
US\$50,000,000 5 1/4% Convertible Bonds 1998 ("BONDS")
Notice is hereby given that in accordance with Condition 6(b) of the Terms and Conditions of the Bonds, the Company will redeem all of the outstanding Bonds at 104 1/4% per cent of their principal amount on September 26, 1986 when interest on the Bonds will cease to accrue.
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ORIENT LEASING CO., LTD.
By: THE CHASE MANHATTAN BANK, N.A.
London, Principal Paying Agent
August 26, 1986

ADVERTISEMENT
The International Corona Group of Companies
Peter Steen, Theodore Rhenius, Henry Ewanochuk, Gil Leathley, Anthony Walsh, Shirley Kozel, Hans Pump
Peter Steen, Chairman, President and Chief Executive Officer of International Corona Resources Ltd., and Royex Gold Mining Corporation; Chairman of the Board of Mascot Gold Mines Limited, is pleased to announce the appointment of Gil Leathley as Senior Vice-President, Operations of International Corona Resources Ltd. and Royex Gold Mining Corporation.
Mr. Leathley will join the existing Corona Group Management Team which also includes:
Theodore E. Rhenius, Senior Vice-President and Chief Financial Officer of International Corona Resources Ltd.; Royex Gold Mining Corporation; Mascot Gold Mines Limited.
Henry Ewanochuk, President and Chief Executive Officer of Mascot Gold Mines Limited; Senior Vice-President, Exploration of International Corona Resources Ltd.; Royex Gold Mining Corporation.
Anthony P. Walsh, Corporate Controller of International Corona Resources Ltd.; Royex Gold Mining Corporation.
Shirley A. Kozel, Corporate Secretary of International Corona Resources Ltd.; Royex Gold Mining Corporation; Mascot Gold Mines Limited.
Hans Pump, Controller-Operations of International Corona Resources Ltd.; Royex Gold Mining Corporation.
International Corona, an independent gold mining company with substantial interests in the Hemlo area, is also the largest shareholder in Royex Gold Mining Corporation, a public company engaged in the exploration, development and management of gold properties in North America. Royex is the largest shareholder of International Corona, with a controlling interest in Mascot Gold Mines Limited. It also owns 50% of and manages the Renabie Gold Mine joint venture. Mascot is currently developing a major gold mine near Hedley, B.C., and is the exploration arm of the International Corona Group.

UK NEWS

Tin brokers say ITC members acted unlawfully

BY ANDREW GOWERS

A GROUP of 11 London Metal Exchange brokers has formally accused the 22 member governments of the International Tin Council (ITC) of acting unlawfully and irresponsibly in the events surrounding the tin crisis.

The brokers have grouped together under the name of Tinco Realisations to attempt to recover losses totalling about £400m which they sustained when the tin market collapsed in March. They made their claims in a briefing document published at the weekend and circulated to trade ministers of the ITC member countries, including Britain.

The release of the document marks the latest attempt by Tinco Realisations to put public pressure on ITC members to admit liability for the council's debts on which it effectively defaulted when its price support operation in the tin market collapsed last October.

The brokers clearly remain anxious to reach an out-of-court settlement if possible, though they reiterate in the new document that they have received "the strongest legal advice concerning the culpability and liability of the member states, and it is difficult to imagine the member states receiving contrary advice."

Thatcher to visit Moscow next year

MRS MARGARET Thatcher, the Prime Minister, has formally accepted an invitation to visit Moscow next year for talks with Mr Mikhail Gorbachev, the Soviet leader, Michael Cresswell writes.

The visit, first suggested during the recent trip to Britain by Mr Edward Shevardnadze, the Soviet Foreign Minister, will be Mrs Thatcher's first working visit to Moscow. She attended the funeral last year of Mr Konstantin Chernenko, the former Soviet leader.

Mrs Thatcher has written to Mr Gorbachev, suggesting that the two leaders fix a date for some time during 1987.

The timing of the visit will inevitably give rise to speculation about the date of the next general election in Britain, given the potential electoral boost for any prime minister undertaking such a top-level mission.

JOHN BROWN Engineers has teamed up with Aker Engineering of Norway to set up joint companies to handle the management, design and engineering of offshore projects.

Initially, the companies will work in the UK and Norway, but the agreement is aimed at leading the way to broader co-operation in the international offshore market.

John Brown, part of Trafalgar House, will hold 55 per cent of a London-based company, John Brown-Aker, and Aker will own the rest. In Oslo, the holdings will be reversed in the other company, Aker-John Brown.

THE LABOUR Party is considering the creation of a new tier of regional councils as part of proposals for restructuring local government in England and Wales.

The plan, aimed at streamlining the present system of local government and improving democratic control at regional level, could involve the abolition of the 47 existing county councils and their replacement by up to 12 regional authorities.

HORIZON TRAVEL, Britain's third biggest tour operator, made a further attack in the holiday price war with the publication of revised winter brochures.

Some skiing holidays have been reduced by up to £60 with price cuts of up to £71 and the addition of an extra 20,000

Cereals harvest expected to be good in both yield and quality

BY JOHN CHERRINGTON

THE BRITISH cereals harvest has started slowly this year, but most farmers have been surprised by the yield and quality of the crops. Some believe it could be a vintage year for grain.

Most fields of wheat, in particular, appear to be of a very high standard, according to an informal survey at the weekend.

The quality of the crops is good, considering that autumn-sown fields of wheat, barley and oilseed rape suffered badly from poor weather in winter and late spring. Many were then thought to need re-seeding.

Wheat has recovered well in many parts of the country from ear-

ly thinning. Oilseed rape yields are reported to be a good average. Spring-sown barley has been yielding very well.

The only disappointing reports have come from farmers growing autumn-sown barley, where yields have been unremarkable.

But three quarters of the crop is still in the fields being battered by poor weather, and losses of both yield and quality could yet be substantial.

The Home-Grown Cereals Authority said earlier this year that, if yields were as high as in the bumper year of 1984, the 1988 harvest - particularly of wheat - could set a record. Wheat plantings have risen

by 4.6 per cent this year to 1.99m hectares.

The 1984 UK grain harvest totalled 28.5m tonnes while last year production fell to 22.47m tonnes.

If there is another large British harvest, it will add to the already bulging stores of surplus grain. Heavy supplies may also diminish the premiums which might otherwise be earned by quality milling wheats, and the official intervention stores may turn out to be the destination of much of this grain.

But for some cereals, demand - particularly for export - is healthy owing to drought elsewhere in the European Community.

Foden competes for army deal

BY KENNETH GOODING, MOTOR INDUSTRY CORRESPONDENT

FODEN, the subsidiary of Paccar of the US, is waiting for an announcement about a contract from the Ministry of Defence for 2,000 heavy trucks worth about £250m.

Foden is one of the two front runners in the race for the contract. The other is Scammell, the specialist vehicle producer within the state-owned Rover group (formerly BL).

Both companies would use Rolls-Royce 330 diesel engines, now produced in Britain by Perkins, owned by Variety Corporation (formerly Massey Ferguson) of Canada.

Mr Mark Pigott, managing director of Foden, says he expects the

ministry to make up its mind before the end of this year. Some observers believe the contract will be split between the two contenders. Mr Pigott admits that that is a possibility, but says he has had no indication of the outcome.

The companies have been asked to tender to provide vehicles for the British Army's Drops (Demountable, rack, off-loading and pick-up system) to meet the requirement for faster supply of ammunition between depot and front line.

Drops vehicles not only will be able to cover all types of terrain at relatively high speed but can also load and unload tons of ammunition

in under one minute. The army will want the 2,000 trucks supplied over five years, starting in 1988 or 1989.

Foden, which employs 450 people, produced about 550 heavy trucks (over 24 tonnes gross weight) last year, as well as about 100 military vehicles. In 1986, output of non-military vehicles should rise to about 700.

Mr Pigott says that Foden is operating profitably. The most recently filed accounts for Paccar UK, the major asset of which is Foden, show that in 1984 it suffered a net loss (after tax) of £53,000, down from a loss of £1.43m the previous year.

TSB to announce flotation timetable

BY DAVID LASCELLES, BANKING CORRESPONDENT

THE EXACT timetable for the flotation of the Trustee Savings Bank is to be announced tomorrow with the release of the pathfinder prospectus by Lazard Brothers, the bank's merchant bank advisors.

The document will also pave the way for the UK's largest issue of bank shares by giving detailed financial information about the TSB and making a forecast of the group's profits for its current financial year.

One crucial piece of information will be missing - the price of the issue which will not be decided until "impact day" after which there will be about 10 days for investors to

lodge their applications for shares.

The issue, due for mid-September, is expected to raise in excess of £1bn for the Trustee Savings Bank. Lazard has been working on assumptions ranging as high as £1.6bn, though a more likely range is thought by the City of London to be £1.2bn-£1.4bn.

The key factors in the pricing will be the levels at which other bank stocks are selling and the yields available on them. If the TSB's shares are priced at seven times its expected earnings of about £185m this year - a ratio in line with the other big clearing banks - the issue would yield a total of £1.3bn.

From these figures, however, will have to be deducted about £170m to cover issue costs and account for shares being handed out free to employees or earmarked for a special loyalty fund to reward shareholders who keep their shares for three years after the flotation.

Many of Lazard's calculations are also based on the assumption that the dividend will yield about 5.5 per cent, again broadly in line with the clearers. Because the TSB will be seeking many private shareholders who are accustomed to keeping their money in building societies, it will probably emphasise the yield as a familiar measure.

Petrol prices likely to rise by 7p a gallon

BY LUCY KELLAWAY

OIL COMPANIES are preparing for another round of petrol price rises which is expected to raise pump prices by about 7p to a typical charge of 170p or more a gallon.

The move, which is expected within the next week, is likely to go ahead despite the criticism which accompanied the last rise, announced earlier this month.

The second rise is likely to be blamed on the recent increase in crude oil prices. Oil companies said that the 7p increase announced two weeks ago took no account of higher crude oil prices, but was a much needed correction to the steady ero-

sion of petrol prices in the past few months.

At an average price of 157p a gallon, oil companies claimed that they were making little, if any, profit from selling petrol.

At the time of the first rise, BP gave a warning that another increase in petrol prices would be necessary by the end of the month to reflect higher crude prices. In the last few weeks crude oil has risen from about \$10 a barrel to about \$14, although it is still only half the level at the start of the year.

Editorial comment, Page 12; Lombard Page 13

THIS NOTICE DOES NOT CONSTITUTE AN OFFER FOR SALE AND THE STOCKS LISTED ARE NOT AVAILABLE FOR PURCHASE DIRECT FROM THE BANK OF ENGLAND.

ISSUES OF GOVERNMENT STOCK

The Bank of England announces that Her Majesty's Treasury has created on 22nd August 1986, and has issued to the Bank, additional amounts as indicated of each of the following Stocks:

£200 million 11 per cent EXCHEQUER LOAN, 1990
 £150 million 10 per cent CONVERSION STOCK, 1996
 £150 million 8 1/2 per cent TREASURY STOCK, 2002

The price paid by the Bank on issue was in each case the middle market closing price of the relevant Stock on 22nd August 1986 as certified by the Government Broker.

In addition, Her Majesty's Treasury has created on 22nd August 1986, and has issued to the National Debt Commissioners for public funds under their management, additional amounts as indicated of each of the following Stocks:

£100 million 11 per cent EXCHEQUER STOCK, 1989
 £100 million 10 1/2 per cent EXCHEQUER STOCK, 1987

In each case, the amount issued on 22nd August 1986 represents a further tranche of the relevant Stock, ranking in all respects pari passu with that Stock and subject to the terms and conditions applicable to that Stock, and subject also to the provision contained in the final paragraph of this notice; the current provisions for Capital Gains Tax are described below.

Application has been made to the Council of The Stock Exchange for each further tranche of stock to be admitted to the Official List.

Copies of the prospectuses for 11 per cent Exchequer Loan, 1990 dated 8th February 1986, 10 1/2 per cent Exchequer Convertible Stock, 1989 dated 22nd November 1985 (which contained the terms of issue of 10 per cent Conversion Stock, 1988) and 8 1/2 per cent Treasury Stock, 2002 dated 12th August 1985 may be obtained at the Bank of England, New Issues, Watling Street, London, EC4M 9AA.

The Stocks are repayable at par, and interest is payable half-yearly, on the dates shown below.

Stock	Redemption date	Interest payment dates
11 per cent Exchequer Loan, 1990	12th February 1990	17th February 12th August
10 per cent Conversion Stock, 1996	15th November 1996	15th May 15th November
8 1/2 per cent Treasury Stock, 2002	27th August 2002	27th February 27th August

The further tranches of 11 per cent Exchequer Loan, 1990 and 10 per cent Conversion Stock, 1996 will rank for a full six months' interest on 12th February 1986, 15th November 1985 and 27th August 1986 respectively. The further tranches of 8 1/2 per cent Treasury Stock, 2002 has been issued on an ex-dividend basis and will not rank for the interest payment due on 27th August 1986 on the existing Stock. Official dealings in the Stocks on the Stock Exchange are expected to commence on Tuesday, 26th August 1986.

Each of the Stocks referred to in this notice is specified under paragraph 1 of Schedule 2 to the Capital Gains Tax Act 1979 as a gilt-edged security under current legislation exempt from tax on capital gains, irrespective of the period for which the Stock is held.

Government statement
 Attention is drawn to the statement issued by Her Majesty's Treasury on 29th May 1985 which explained that, in the interests of the orderly conduct of fiscal policy, neither Her Majesty's Government nor the Bank of England or their respective servants or agents undertake to disclose tax changes decided on but not yet announced, even where they may specifically affect the terms on which, or the conditions under which, these further tranches of stock are issued or sold by or on behalf of the Government or the Bank; that no responsibility can therefore be accepted for any omission to make such disclosure; and that such omission shall neither render any transaction liable to be set aside nor give rise to any claim for compensation.

BANK OF ENGLAND
 LONDON
 22nd August 1986

THE FINANCIAL TIMES
 is proposing to publish a survey on
EMPLOYEE WELFARE
 Friday, September 19, 1986
 For further information please contact:
 MARK FISHER
 on 01-245 8000 ext 3389
FINANCIAL TIMES
 EUROPE'S BUSINESS NEWSPAPER

A BANK WHICH SPANS THE LENGTH AND BREADTH OF THE WORLD'S MOST DYNAMIC REGION.

The Pacific basin. Today, the arena for over half the world's trade. And today as for many years, home ground for Standard Chartered Bank. Standard Chartered has built a presence throughout the Far East which remains unrivalled today. While Union Bank, now a leading business bank in California, represents a successful US acquisition by a British bank. The result is a geographical spread - of over 250 branches in the Pacific basin - which is now the envy of many banks scrambling for footholds in the region. It is a powerful example of the way that Standard Chartered's management strengths have built an international network, of more than two thousand offices in over sixty countries. A network which is highly-integrated, built on common procedures and information systems: but made up chiefly of offices which play a central and established role in their domestic markets. And thus, a network ready to serve the needs of international business, of local business and of private individuals. To find out more, contact your nearest branch.

STRENGTH IN DEPTH ACROSS THE WORLD.
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MANAGEMENT: Small Business

Technology start-up

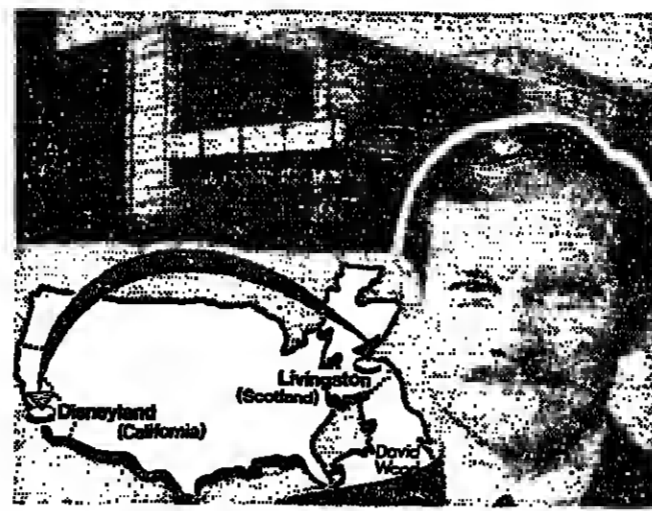
IPS heralds a new scale of risk funding

BY WILLIAM DAWKINS

WERE IT not for the persistent icy drizzle, visitors to Integrated Power Semiconductors' blue steel and glass factory might be forgiven for thinking they were in California.

There have, on the other hand, been compensations. Keeping that group fully informed has been a significant burden for IPS.

computer businesses, though its devices can be used in many other products, where mechanical parts are controlled electronically.



Livingston (Scotland) and Denver (Colorado) are the sites of the new Small Business Support Group.

In brief...

A NEW source of help for first time microcomputer users in trouble emerged last week with the launch of the newly formed Small Business Support Group.

Based in Broadway, Worcestershire, the group consists of six microcomputer software experts who aim to provide instant telephone assistance for buyers of most makes of microcomputers available in high street shops.

By round three—£2m in June—the semiconductor industry's depression had stubbornly refused to end, but Wood and his team could ill afford to spend days pleading their case in the City all over again.

OWNERS and managers of small companies seeking to expand can join Middlesex Polytechnic next month for a training programme funded by the Manpower Services Commission.

Entitled Action Learning For Managers, the course encourages participants to learn from each other and to develop skills in areas like finance, marketing, or personnel.

The course starts with a weekend session on September 13 and 14 and continues with 12 Tuesday evening meetings at the Middlesex Business School in Hendon.

YORK ENTERPRISE, the city's enterprise agency has launched a £250,000 business development fund for small ventures likely to create or sustain jobs in the area.

How to assess a market

Martin Posner continues his series on exporting

THE NEXT step for a business that has decided to explore the possibilities of exporting is to assess the market for that first overseas order.

A quick read of the UK's 50-page review of Italy covers population, politics, economic growth, average incomes, share of production and services, banking and finance.

A good start is to look at the detailed statistics of the Export to Europe branch of the British Overseas Trade Board. Those who show among other things that Britain's exports to Italy were worth £5.5bn in 1985, making it the UK's sixth biggest market.

This information is free to all businesses. Further sources are the country reports issued by all major clearing banks.

Free professional advice is also available from the board on how to get about market research for exporters or potential exporters of goods or services produced in the UK.

Reading this general background material will help the first-time exporter to develop a feeling for the target country.

It is now possible to start assessing the market for the product or service to be exported. The BOTB operates a Market Prospects Service through which it can contact the 170 British embassies and consulates abroad to obtain the type of help available from local commercial attaches.

Once the budding exporter has given a description of his company and its goods or services, copies of trade literature and, if possible, a product sample, the commercial attaché's office will then make specific enquiries to assess the prospects.

Yet rather than being in Silicon Valley, IPS is in the heart of Scotland's Silicon Glen in the new town of Livingston.

IPS is the largest UK start-up ever financed by British venture capital unless one counts European Silicon Structures, the pan-European semiconductor business which has pulled in £49m since its launch last September.

IPS has so far raised £14.5m of equity finance in three successive rounds of funding, an ambitious arrangement for a venture capital industry that until recently tended to stick to single tranches of cash.

No British venture capital group is big enough to stump up that kind of money on its own, so syndication was the only answer.

Smartpower

It comes as no surprise that Wood, appropriately a Californian, met extreme difficulty in persuading the City to back his plan for the first significant UK semiconductor maker since the birth of the troubled Immos in 1978.

Semiconductor makers have traditionally tended to serve one of two markets: devices for controlling the power that goes into circuits, or the circuits themselves.

Wood's idea was to do both—to put power and logic on to one chip, thereby enabling IPS to replace circuit boards with devices the size of a pen top, or smartpower in industry jargon.

"We are in the middle, trying to pick up a vast market that is only being served in dribs and drabs by both sides," he explains.

Second round

However, the recession in the semiconductor industry has meant that prices for second source products have dipped by up to 20 per cent since Wood drew up his plan.

After spending another £100,000 or so criss-crossing the Atlantic (when the share options ran out, his wife sold her Corvette sports car), Wood eventually won the support of Peter English, then a 31 Venture executive.

It was less difficult for Wood to identify 12 senior US semiconductor executives—now the core of the 130-strong business prepared to follow him on condition that he raised the cash.

"But by April 1984, the first

£5m round was in place and IPS was able to start marketing semiconductors made under contract by Motorola in France.

Starting in a rented office near Darnley, the group moved into the basement of Livingston Development Corporation headquarters before its £5m leased factory was finally ready by last November.

But in the two-year period needed to raise finance, a cornerstone of Wood's business plan had started to crumble.

"The strategy was (and remains) to build up credibility and a dependable revenue base by establishing IPS as a second source for existing chip designs. Proprietary IPS products would come later.

Wood knew from the start that he would have to work full-time to persuade Britain's venture capitalists to back such an unusual plan.

Business Opportunities

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COMPANY WANTED. A profitable property company anticipating profits of at least £1 million wishes to acquire a company with trading losses or excess management charges earned forward, or with current year losses or allowances available for 1985.

APPOINTMENTS

Alex. Stenhouse creates new division

ALEXANDER STENHOUSE has formed an aviation and aerospace division. The new division has been specially created to handle exclusive purposes of providing London marketing services for the US and Canadian aviation operations of Alexander & Alexander Inc and Alex Stenhouse, as well as for international space and satellite interests. Appointed as divisional directors are Mr A. H. Elson, D. J. Woods, Mr K. A. Webb and Mr K. H. Coombe.

FEDERATION to succeed Mr Donald Anderson who has taken up a senior position with Courtauld.

FIRTH CARPETS has appointed Mr John Stocks to the board. Mr Stocks, who has been buyer with the company for four years, now becomes purchasing director.

Mr T. R. Usher has been appointed a director of FORTEN CLAN HOLDINGS of Vancouver, BC. He is currently executive chairman of the UK subsidiary, CHANCELLOR INSURANCE CO. Mr F. P. Mannix and Major-General M. St. G. Cribben have been appointed directors of Chancellor Insurance Co.

Mr Walter Dickson, formerly president of Mars Europe, is to become a director of GLANFIELD LAWRENCE.

Miss Gillian Eastance, chief executive of the Senior Secretaries group, has become the first woman to be appointed chairman of the FEDERATION OF RECRUITMENT AND EMPLOYMENT SERVICES. Miss Eastance also sits on the smaller firms council of the Confederation of British Industry.

At I. G. LINTELS Mr Wayne Palmer has become a financial director and company secretary. Mr Pulman who joined I. G. Lintels in August 1986 as financial manager and company secretary will now be in overall control of the company's financial affairs.

Mr Stephen Finch has been made a director and deputy chairman of NOBLE & LUND. He was previously deputy chairman of West Group and a director of Suter.

COMPUTER SECURITY has appointed Mr John Small as financial director and Mr Peter Herbert as marketing director. Mr Small has an extensive background with Black & Decker and latterly with Allegheny International where he rationalised the Rowenta and Sunbeam subsidiaries. Mr Herbert has worked in the communications field for both the BBC and Logica as well as in sales management for IBM.

CONTRACTS

£15m radar order for Marconi

ARMCONI RADAR SYSTEMS has been awarded a contract worth £15m by the Royal Air Force to supply defence radars and to modernise radar facilities in the kingdom of Jordan. The contract follows the Memorandum of Understanding for the £247m Jordan Defence package signed during the visit of Mr Margaret Thatcher to Jordan in last September. A significant element of the current project is the radar has supplied over a period of 25 years.

DELTA GROUP has won orders worth over £5m to supply the Hong Kong construction industry with electrical equipment. The most recent, worth over £500,000, is for the supply of switchgear for the Lutetia Parkway Development—a £100m, 1,000 apartment project being built by Trivium. Other orders that Delta are currently handling include: the supply of ceiling and electrical switchgear to the Swire Group's Tai Koo Shing development of 7,000 residential apartments; the outfitting for the Hong Kong and Shanghai Bank's new headquarters and contracts to supply the Government of Hong Kong with cabling and switchgear for its 35,000 houses-per-year low cost housing programme; and the construction of the new Tesco Maen Hospital.

BELLING LEE INTEC has won orders worth around £1.5m. It has, in conjunction with its agency in Norway, S. Svendsen, secured a contract for the supply of fibre optic digital and analogue communications equipment, over the next five years, to the Norwegian Defence Communications Agency. The contract is worth £1.2m, with an option of expansion once the initial systems are installed. The systems will form part of the Norwegian defence digital network, using multi-

players and modems made by Belling Lee Intec, a member of the Cambridge Electronic Group of companies.

The first phase of a contract, valued at £200,000, has been secured to supply EMP suppression systems and RF screened doors to Portugal, through its agent, Centra Services. As a result of the increase in the use of high technology solid state devices in motor vehicles is a joint venture by Belling Lee Intec with Emerson Cuming Europe for the construction of a welded steel EMC suppression chamber at the Motor Industry Research Association. This will be complete with microwave anechoic materials and full mechanical and electrical services. The total project value will be around £200,000.

A contract worth around £3m has been awarded to PRESS OFFSHORE by Press Aberdeen Development for hook-up work on the Forties Echo platform. Part of the South East Forties project, the contract will be carried out by Press's Aberdeen-based offshore services division. Under the management of a BP project team, Press will provide supervision, skilled labour and plant to hook-up and commission the platform's production systems and utilities after installation of the jacket and topsides modules. Onshore preparation will begin in the late summer in readiness for an offshore start in October.

RCC SUPER TENSION CABLES has received an order worth £5m from the Central Electricity Generating Board. The contract is for the design, manufacture, testing and installation of 17.7 km of 400 kV single core 000 sq mm copper conductor, insulated aluminium sheathed (I) cable and accessories. BIS FUNDMASTER 38 is the IBM System 38 version of BIS FUNDMASTER. It is a multi-currency investment management system designed to satisfy present and foreseeable requirements of UK clearing and merchant banks, international banks, pension funds, insurance companies, building societies and other large fund managers. Barclays will be installing FUNDMASTER 38 at its securities industry branch in Old Broad Street, London. BIS claims the system can save about 40 per cent of

Liberty Life Association of Africa Limited

Interim report for the six months ended 30 June 1986

Table with 4 columns: 6 months ended 30 June 1986, 6 months ended 30 June 1985, % change, and 1985. Rows include: Net premium income, Net income from investments and steady income, Total income, Net interest expense, Dividend per ordinary share (1986), Dividend per ordinary share (1985), Dividend per preferred ordinary share (1986), Dividend per preferred ordinary share (1985).

3. Interim ordinary dividend: In accordance with the company's dividend policy of declaring interim ordinary dividends at a level of one-half of the annual ordinary dividend for the immediately preceding financial year, the directors have resolved to declare an interim ordinary dividend of 150 cents per ordinary share in respect of the year ending 31 December 1986.

1. Life insurance operations: Due to the general responsibility of underwriting full actuarial valuations other than at the end of the financial year, no valuations of the life branch of Liberty Life and its subsidiary, Charter Life Insurance Company Limited, are conducted at the half-year stage. For the purpose of this interim report and following the company's established practice, the net earned surplus has been included on the basis of an estimate which results in the net earned surplus per share being shown at half the rate achieved for the previous full financial year ended 31 December 1985.

Businesses for Sale

FARMER ROPER LIMITED. The Joint Receivers offer for sale the business and assets of a well established industry leader in the manufacture and installation of melting plant for foundries and pollution control equipment. Located in Keighley, W. Yorkshire. Well equipped metal fabrication factory (freehold 18,500 sq ft). Hot and cold blast Cupola Systems Technology. 'Perfecapour' computer controlled pouring unit. Extensive range of Roper spare parts, tools and dies. Factory premises of 60,000 sq ft on plot of 1.3 acres available for immediate occupation or re-development.

ENGINEERING BUSINESS FOR MERGER. Long established engineering company involved in the installation, service, repair and refurbishment of specialised capital equipment plus regular sales of spare parts has potential to significantly improve its current profits by amalgamation with similar business. Engineering skills involved include mechanical, hydraulic and electrical. Space is available at current premises for parts store, machinery awaiting repair, etc., and similar facilities would be required if business were to be moved. Current location: 5, London area—specialist engineering staff and management available. Regular and continuing business ensured through exclusive arrangements with equipment manufacturers and importers. Present T/O approximately £500,000 p.a. Holding Company owners would consider sale, merger or purchase of complementary business. Principals only write Box H1130, Financial Times, 10 Cannon Street, London, EC4P 4BY.

PLASTIC COATINGS. 67/0 1985/1986 £240K. Offers are invited for the business which has been trading for 5 years and specialises in the coatings market for decorative and performance enhancement, enabling plastics to be scratch resistant and impervious to a wide variety of chemicals. Enquiries initially to Managing Director, Box H1133, Financial Times, 10 Cannon Street, London, EC4P 4BY.

ENVIRONMENTAL CONTROL COMPANY FOR SALE. A chemical engineering company specialising in the design and supply of equipment to control air pollution from industrial processes seeks acquisition by large company to provide finance to enable realisation of potential growth and profits. Turnover approximately £500,000 p.a. Registered in 1970. Over 230 operating installations. Box H1144, Financial Times, 10 Cannon Street, London EC4P 4BY.

Large Car Sales Showroom. Superb main road position in West London. Fully equipped, modern premises including large car wash. Estimated sales of 3,000 cars p.a. Excellent security. 100,000 profit. 24 hours service from premises only. Write Box H1138, Financial Times, 10 Cannon Street, London EC4P 4BY.

ENGINEERING GROUP OF COMPANIES. Turnover £31 million, sound profit record. Market leader in own products. Freshhold property SE England. Write Box H1141, Financial Times, 10 Cannon Street, London EC4P 4BY.

For sale. Specialist Employment Agency and Hi-Tech Contract Inspection Company. Turnover £1,700,000. 100% profit. £1.2m going concern. KYRSTON'S 220 Vauxhall Bridge Road. Company Acquisition and Sales Specialists.

VICTOR CASTINGS LIMITED. The Joint Receivers and Managers offer for sale the business and assets of Victor Castings Limited. Grey iron and malleable iron foundry. Annual turnover c. £650,000. Located with factory in 1.2 acre freehold site in Tipton, West Midlands. Enquiries to G. D. Cook/R. Weston: Arthur Andersen & Co., 1 Victoria Square, Birmingham B1 1BD. Tel: 021-2332101.

HOLDING COMPANY OFFERS SMALL ENGINEERING/MANUFACTURING COMPANY IN THE SW OF ENGLAND. For Sale or Participation by a U.K. Engineering firm of at least middle size. Confidential reactions to: Box H1138, Financial Times, 10 Cannon Street, London EC4P 4BY.

HAULAGE/DISTRIBUTION COMPANY. Operating nationally and internationally from freehold depot in SE England. Turnover in excess of £13m. Controlling interest available. Please contact: K. J. Owen, OWEN-OWEN, 74 Pall Mall, London, SW1. Tel: 01-739 7571.

Hotels and Licensed Premises. ESTABLISHED TOWN CENTRE HOTEL. LOCATED ON A PRIME SITE IN A RAPIDLY EXPANDING EAST MIDLANDS CITY, WITH PROVEN MARKET. Planning consent for 80 beds, on a freehold site with adjacent parking. Available now as a development opportunity: purchase, lease or partnership would be considered. Write Box H1137, Financial Times, 10 Cannon Street, London EC4P 4BY.

Horticultural Business. Plant propagation nursery specialising in modular production of vegetable plants for the farming industry. The business and assets are offered for sale on a going concern basis and comprises: 11 acres of modern aluminium glass houses with specialised equipment on 5 acre freehold site in the Lea Valley. Production of over 50 million plants per annum has been achieved with additional glass. Further information may be obtained from: The Joint Administrative Receiver, P.R. Copp FCA, FCCA or E.V.L. Blackwell FFA (ref KQ) 8 Baker Street, London W1M 1DA. Telephone: 01-486 5888.

Stoy Hayward. By Order of R. W. Cook, Esq., FCA re: Peter Wilton Components Ltd (in Liquidation). AUTO FACTORS. Modern Fully-Equipped Distribution Premises - Watford. 3,900 sq ft—Offices, Flat and extensive Warehouse. Stocks of Commercial Vehicle parts at Cost \$110,000. FOR SALE. Full details from Ref: GSM. EDWARDSYMONS. 56/62 Wilton Road, London SW1V 1DH. 01-834 8454. Telex: 8954348. And at Manchester, Liverpool & Bristol.

Company Notices. THE RANDFONTEIN ESTATES GOLD MINING COMPANY, WITWATERSRAND, LIMITED. Incorporated in the Republic of South Africa. Registered No. 5170226/108. ON SHARE WARRANTS TO BEAKER. Pursuant to the notice published on 27th June, 1986 members are informed that 720 of the shares of 100 units each of the above company are to be disposed of by the United Kingdom Paying Agents on 4th September, 1986 in a fund of 100 units each of 100 units of the above company. The gross dividend payable by the United Kingdom Paying Agents is therefore estimated to be £100,000.00. The London Branch Office of Hill Samuel & Company Limited, 45, Beach Street, London EC2A 3DF, is the Agent for the distribution of the dividend. Amount Payable (U.K. Currency) £58,9143.38. AMOUNT PAYABLE WHERE A U.K. INLAND REVENUE DECLARATION IS LODGED WITH COUPONS 218,3772. AMOUNT PAYABLE WHERE COUPONS ARE LODGED WITH DECLARATIONS 36,9680. AMOUNT PAYABLE WHERE COUPONS ARE LODGED WITH DECLARATIONS 182,4092. Coupons must be used in full and are obtainable from the London Branch Office and deposited for collection on any weekday (Saturday excepted) at least seven clear days before payment is required. BARNATO BROTHERS LTD. Mr. J. Barnato, Secretary.

For Sale by the Receiver and Manager The Business and Assets of Kirk Holdings Limited Kirk (Constructions) Limited Kirk Developments Limited (in Receivership). building and civil engineering contractors. Turnover approximately £9.2m per annum. Approximately 170 skilled and semi skilled employees. Extensive freehold offices, workshop and yard situated in Skipton, North Yorkshire. Building and civil engineering contracts nationwide. Property portfolio which includes a fully let development valued at approximately £0.5m. General contractors equipment including piling plant. Further details are available from the Receiver and Manager, Ralph S Proce, FCA.

Touche Ross. 11 Albion Street, Leeds LS1 5PJ. Telephone: 0532 44741. Telex: 556376 TRLEED G. Developers wish to dispose of SUBSTANTIAL DEVELOPMENT SITE with full Planning Permission in South Wales. Full details to principals only. Write Box H1128, Financial Times, 10 Cannon Street, London EC4P 4BY. We wish to dispose of a profitable and well-established chain of approximately 200 C/TNs and CONVENIENCE STORES. Offers are sought for the business as a going concern. Interested parties should contact: Box H1133, Financial Times, 10 Cannon Street, London EC4P 4BY.

TECHNOLOGY



Peter Bruce in Bonn tracks the progress of Westphalia Separators, a leading separator maker

Where robots now stalk the factory floor

IT HAS become quite hazardous to walk about the main machining shop at Westphalia Separator's sprawling works in Oelde, a small town just north of the Dortmund-Hanover auto-hub. For about two years now the floor has been the preserve of two brooding, computer-controlled workpiece transporters and they are not programmed to avoid visitors.

Westphalia Separator, founded in the town in 1893, is the world's second biggest producer of high speed centrifugal separators—along with the industry leader, Sweden's Alfa Laval, it commands more than half of a market estimated to be worth roughly DM 1.8bn (US\$866m) a year. Its ubiquitous product, or ones like it, forms the core of any operation requiring the separation of two fluids or fluids from solids to produce anything from cream and cheese to coffee extract, oil from shale and antibiotics.

after 1945 the chemicals industries in Europe and the US began to make huge demands on separator producers. Separator technology and to adapt itself to very large capacities and to automation. Today about 60 per cent of Westphalia's revenue is earned in non-dairy markets.



Cheese is just one dairy product which relies upon the separator for its manufacture

at the shop floors. Neither has the system led to any real increase in production. "That was not the reason we bought it," he says. Having been to the machine tool shows and "sized up the variables you are led to one decision—FMS."

do is stop inventing," says Mr Herbig. If the intervention of politics had not been enough to convince Westphalia Separator management that they had been right to invest in a (potential) cost cutter like FMS then the radioactive fallout from the Soviet nuclear reactor at Chernobyl earlier this year probably did the trick.

chiefs weep if they fail to do that every 12 months) and net profits for last year totalled DM 12.4m. Although the FMS has already paid for itself, Mr Habig is also adamant that it be used to the full and the company has begun to examine ways of doing more with the machines in a third shift when the system is not being used.

Measuring finishes

PLASTICS and surfaces machined to mirror finishes may not be as smooth as they seem. So Hahn and Kolb has developed an optical sensor which can measure surface roughness without contact which is particularly applicable to delicate materials.

Image processing

IMAGE processing becomes markedly cheaper with a UK-developed system from Data Harvest of Bedford, which is making and selling a system for industrial, security, scientific and other fields that costs only £395.

Office planning

INTERGRAPH, one of the leading specialist makers of computer aided engineering, design and manufacturing systems has launched some software for planning the layout of an office of production facility. The software makes use of database technology. It has two databases—one for catalogues and the other for projects.

Monitoring moving components

PANDROL International has launched a system which can measure the movement between neighbouring components. This has already been used in the railway industry to study the movement of the rail relative to the support sleeper which can indicate any likely faults in the railway line as vehicles travel over it.

Hunting for particles

THE PRESENCE of particles in fluids can cause damage to plant and machinery. Monitoring the amount of such particles in lubrication oil, for example can indicate that a machine will need repair or maintenance.

IBM PC acts as a telephone

PHONE TERMINALS are created from the IBM personal computer (PC) or a compatible model by plugging in a circuit board from Telecom. The board, based at Lancing in East Sussex is now marketing a wear monitoring instrument developed by Fulmer Research Laboratories based on this principle.

Sun and wind power join forces

THE FIRST use of combined wind and sun power to heat houses in Britain was demonstrated last Friday at the opening of the Energy World exhibition at Milton Keynes.



SO'AMPEL MILAN 17 - 20 OCTOBER 1986 INTERNATIONAL EXHIBITION MILAN FASHION SQUARES PIAZZA S. FERDINANDO PROMOTED BY S.V.P. (Consorzio Sviluppo Vendita Pelle)

DKB ECONOMIC REPORT August 1986: Vol. 15, No. 8

Japanese economy will grow 2.4% in fiscal year 1986

In 1986, the U.S. economy is expected to grow 2.5 per cent in real terms. Buoyed by declining oil prices, lower interest rates and a weaker dollar, U.S. business activity will advance moderately this autumn. Due to the huge surplus in Japan's current account balance, the yen will remain strong during the year. The yen will remain around 160 to the U.S. dollar in fiscal 1986.

causing brighter signs of recovery. Outlook for each demand segment Personal consumption will increase 3.0 per cent in real terms, higher than the 2.7 per cent in fiscal 1985. Although nominal personal income growth will slow down due to low pay hikes and less overtime work, real personal income will show a higher growth rate, helped by price stabilization.

Private housing investment is expected to increase 4.9 per cent in real terms, higher than in fiscal 1985. Housing starts will be promoted by lower materials prices, lower interest rates, tax cuts and softer housing loans.

Public demand will expand 9.0 per cent in real terms, accounting for 5.5 percentage points of the 2.4 per cent real growth rate in fiscal 1986. The 1.5 point contribution will be the highest since fiscal 1978 when an expansionary fiscal policy was adopted.

point contribution from a minus 0.2 point contribution in fiscal 1985). The downturn will be attributable to a fall in external demand (to minus 1.9 points from plus 0.7 points) and a slowdown in private demand (to minus 2.7 points from plus 3.7 points).

Balance of payments Japan's current account balance will register an enormous surplus of \$89 billion in fiscal 1986, as compared with a \$5 billion surplus in fiscal 1985. This historically large surplus will be caused by not only the expanding merchandise trade surplus but also the decreasing invisible trade deficit.

Table with columns for FY1984, FY1985, and Percentages for FY1986. Rows include Real gross national expenditure, Domestic demand, Private domestic demand, Personal consumption, Corporate capital investment, Government investment, Public demand, Fiscal capital investment, Net exports, Imports, etc., and International balance of payments.

work of the austerity budget policy, there will be limits on the use of effective fiscal policy. Therefore, stimulating private demand would be a key to sustained economic growth. Specifically, it will be necessary to pass on the benefits of the yen's rise and cheaper oil to the domestic economy as soon as possible and also to promote the demand-expansion measures proposed in the so-called Miyekawa report prepared by Prime Minister Yasuhiro Nakasone's private advisory group.

Talk it over with DKB The international bank that listens. DKB We have your interests at heart. DAI-ICHI KANGYO BANK Tokyo, Japan

The next DKB monthly report will appear Sept. 25.

THE ANGLO-IRISH AGREEMENT

Facing more scepticism than ever

By Hugh Carney in Dublin

THIS WAS to have been Northern Ireland's long hot summer when the battle between the British Government and the Unionist community...

There have been other worrying developments associated with the marches, however. From the point of view of the Catholic minority, the most serious is the revival of sectarian violence by Loyalist extremists...



Mr Peter Robinson (left): pushing Paisley aside?

Supporters of the Agreement, rejected by Unionists for giving Dublin a say in Northern affairs without the consent, felt such threats to play the "Orange card" which in the past has succeeded in blocking political initiatives...

In the workplace, sectarian fear again stalks Northern Ireland following threats to Catholics working in Loyalist areas by the "Ulster Freedom Fighters", a paramilitary group...

On the other side, the Irish Republican Army, opposed to the Agreement for different reasons, has continued to stoke the conflict and bait Protestants by killing and maiming soldiers...

From the Government's point of view, things do not seem too badly. It is true that the RUC and British troops had to be deployed in large numbers to police many parades which ended in violence...

The other feature, especially of recent weeks, has been the emergence of Mr Peter Robinson, Mr Paisley's deputy and MP for East Belfast, at the head of an apparently quite well-organised core of hardline extremists...

Clontarf escapades, the RUC was tipped off and managed to prevent other demonstrations taking place. Certainly, the Loyalists have not proved much yet and it was notable that the thousands they hoped would attend Mr Robinson's court hearing in Dundalk earlier this month turned out to be fewer than 150.

Overall, though, the Government could claim that the security forces were able to cope with the violence that arose and that there was little or no sign of dissent within the ranks of the predominantly Protestant RUC which Loyalists such as the Reverend Ian Paisley, leader of the Democratic Unionist Party, had predicted. Nor has there been, thus far, a repeat of the attacks on police homes and families by Loyalists that

impossible position, unable either to endorse or condemn the antics of Mr Robinson, now more than ever the heir apparent to Mr Paisley as the most uncompromising of Unionist leaders.

The problem for the OUP, or any Unionist with any clout who would like to get back into a dialogue with the Government, is that the terms for doing so simply do not exist. Any attempt that took place while the Agreement progressed would be bowled down by the hardliners.

Unionists' inclination to deal with Dublin, narrow as it is, was even further eroded in June when a proposal to introduce divorce in the Republic was defeated in a referendum, reinforcing Protestant fears of the influence of the Catholic Church in the South.

This virtually rules out any hope that once the marching season is over, conditions might exist for progress under the Agreement towards all-party contact in the province. Mr John Hume, leader of the Catholic Social Democratic and Labour Party, has said he believes that in the autumn some Unionists may emerge ready to talk.

What they are left with is a series of measures being discussed within the inter-governmental conference which, in the words of Mr Nicholas Scott, the Northern Ireland Minister, are designed "to reassure nationalists" whose support for the Agreement is vital if it is to have any success.

Lombard All tanked up but nowhere to go

By Max Wilkinson

SPARE A thought for the poor petrol companies as you race past a pump offering four-star at 165p a gallon. They are faced with an appalling propaganda problem.

For the fourth time this year they are starting to prepare the public for a concerted rise in pump prices, hoping to repeat the asterisk of the second week of August when, by all pushing together, they managed to get four-star up 7p to 165 a gallon.

A faintly ludicrous pattern has now been established. It starts with one petrol company briefing the press that margins have shrunk to an intolerable thinness. A few days later another oil company announces that it is compelled to put up prices and after a decent interval of about three days all the other companies have been "compelled" to follow suit.

By this means the companies avoid falling foul of competition laws which would force them to register any concerted agreement to fix prices. Not for them the furtive telephone calls or a smoke-filled room at the back of the Athenaeum; their exchange is such that conspiracy could not possibly be discovered. It is on the front pages of the national newspapers. Petrol prices exert a peculiar fascination over the British public, perhaps partly because of the annual Budget ritual.

However, so far this year the petrol companies themselves have torpedoed each concerted price rise much faster than the Office of Fair Trading could have hoped to do. Soon after each price rise, competition between the 60 to 70 wholesalers supplying the 20,000 petrol sites has eroded the price again.

Where do all these wholesalers get their cheap petrol from? Some have been able to make a quick profit by picking up cheap cargoes on the Rotterdam spot market and selling at a discount in the UK. However, most of their supplies come from the 12 larger companies (including all the best-known brand names) which have re-including all the best-known price cartel.

refineries in the UK. These refineries sell petrol to competitors which then undercut them. They do it because there is still about 20 per cent over-capacity in the European refining industry and a small extra throughput can make a significant difference to the overall profitability of a refinery.

This is why the three major operators, Esso, Shell and BP, which supply more than half of the UK's petrol, have effectively lost control over the market. It was not always so. During most of 1985 when a weakening dollar pushed the sterling price of crude oil down steeply, the companies managed to maintain impressive control. Although prices eased slightly from their high point of over 200p in March 1985, the margin improved by the final quarter to levels which they had not enjoyed for many years.

This year, however, the fall in crude prices has been too much in the news for its effect on pump prices to be ignored. In case anyone should forget that refiners had accelerated out of the years of loss-making sterling price of crude oil down steeply, the companies reminded everyone in his Budget speech, just to get the ball rolling, so to speak.

Yet the oil companies have a relatively good case. Because nearly 70 per cent of the price at the pump represents excise duty and value added tax, a fall in crude oil prices has a much less effect on the price than most people seem to expect. The cost of raw materials is now only about 32p per gallon.

Yet whatever the oil companies say about a "fair return" the fact remains that there is still considerable over-capacity in the refining industry. The harsh laws of economics say that free competition will reduce margins until the least efficient producer falls to cover his operating costs and goes out of business. This is what has been happening in recent years. Since 1980 a quarter of Europe's refining capacity has been closed. This painful adjustment is not yet quite complete and since refiners' costs are now pretty similar, that means a lean time for all. The only alternative is something the companies cannot talk about and cannot make work—a price cartel.

Exchange rate stability

From Mr J. Williamson. Sir,—John Muellbauer's arguments (August 13) regarding the need for a more competitive sterling exchange rate are compelling. And, as it happens, his estimate of a sensible target for the DM/sterling rate (2.80) is very close to my own.

Nevertheless, the particular phrase that provoked Samuel Britan (August 7) was unfortunate. No one should want to see the exchange rate "set on a firmly declining path," for this would both perpetuate the high interest rates that are now being used to prop up the pound at too high a level and act as an open invitation to wage inflation.

What is needed is not a declining trend for the exchange rate, but a once-for-all downward adjustment to a realistic level. From then on policy should aim to keep the rate roughly constant in real terms, with a constant nominal exchange rate, or even with some nominal appreciation. To the extent that the British economic establishment always seems to balk at this, its commitment to the objective of price stability and that John Muellbauer's phrase suggested sympathy with this position, one can understand Samuel Britan's strictures.

John Williamson, (Senior Fellow), Institute for International Economics, 11 Dupont Circle NW, Washington 20036, USA.

Letters to the Editor

Indeed, both north and south of Watford we have to take this prospect seriously so that our successors do not find themselves with inadequate resources to the great national disadvantage — when the 21st Century begins, less than 14 years from now.

Price, choice and design. From Mr S. Gregory. Sir,—Nick Garnett's note on the risks of cost-cutting (August 8), followed by Merryn Unger's letter (August 16) on price and choice, have been underlined by the European Management Forum report summarised by William Duffforce (August 18).

There are alternative competitive strategies. I think it is useful to note that, although the standard cost-cutting approach—"value analysis"—has been taught and practised in the UK for more than 20 years, no procedure has been taught or obviously practised which deals with building up value in design to fit a market competitively.

Such an approach—we could call it "value creation"—requires at least a methodical search of market returns likely to be made by incremental or step changes in the product. For this to work technically specialised forms of value estimating needs to be developed.

Fruitless search. From the Chairman, Pirbright Group. Sir,—Because we will need to use one, we recently wrote to 12 financial public relations agencies asking a number of questions, and requested that they reply as quickly as possible.

After two weeks we had received replies from only five. We telephoned the remaining seven—three of them said they had not received our letter, and four made excuses for not responding, blaming holidays and sickness. We went to see three of the agencies who had replied and found that none of them had the slightest idea of how to pre-

sent themselves to a prospective client. Two of them immediately told us that we needed a new and more impressive logo, but when we looked at their logos we found them drab and unimpressive. One agency had the most scruffy and untidy reception area and obviously had not considered the importance of creating good first impressions.

We settled on one of the two, and the managing director and another director visited us for three weeks we heard nothing. We then telephoned and were told that they were intending to telephone us that very day! An appointment was made for the presentation, but two days before the event a postponement was asked for.

Another date was made, but we received another phone call, once again postponing! P. Youdale, Tile House, Ridgeway Rd, Stanningdale, Berks.

A stunning building. From Sandra Champness. Sir,—One would be hard pressed to find a more whingeing article than that published on August 18 in your architecture column.

Quite obviously, the new Lloyd's building has faults which must be remedied but it was becoming obvious that the old Lloyd's building in all its white-marbled elegance was beginning to fall far short of requirements.

There will always be those who deplore change, but with its recent and history Lloyd's can well do without this minor carping to add to the problems. It is a pity the "Lloyd's member" was not prepared to be named particularly since, as he so self-righteously points out, he was one who "did not fall for it" when plans for the stunning new building were originally drawn up.

Sandra Champness, Stonerose, Plummers Plain, Horsham, Sussex.

From Mr K. Tunstall. Sir,—Harold Baldwin's article (August 16) mentioned that most companies now cross their cheques "not negotiable" for protection against claims should a thief negotiate their cheques. To similarly protect their personal customers I would suggest that banks supply cheques with pre-printed "not negotiable" crossings, or at least offer the facility.

Keith Tunstall, 39 Grove Street, Leominster Spa, Warricks.

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RESERVE BANK SAYS ECONOMY 'SUBDUED BY LACK OF CONFIDENCE'

SA capital outflow hit \$1bn in first half

BY ANTHONY ROBINSON IN JOHANNESBURG

THE SOUTH AFRICAN economy, hit by social unrest, remained subdued by a lack of confidence and a pervasive sense of uncertainty about the future...

year will be in the 1.5 to 2 per cent range, rather than the 3 per cent growth forecast at the time of the March budget.

Sellafield a hit with tourists

BY IAN HAMILTON FAZEY IN LIVERPOOL

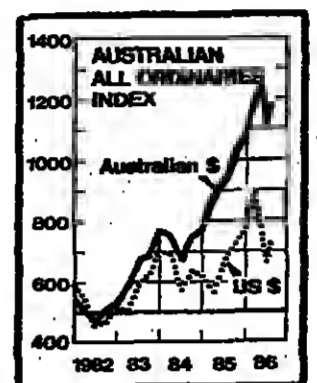
THE CAMPAIGN by British Nuclear Fuels (BNFL) to attract summer visitors to its reprocessing plant at Sellafield, in north-west England, has been so successful that new permanent jobs have been created...

French N-plant mishap likely to delay opening

BY DAVID HOUSEGO IN PARIS

THE opening of the Cattenom nuclear power station in eastern France is likely to be delayed after an accident at the weekend which led to the flooding of underground galleries during the final verification procedures on a reactor.

THE LEX COLUMN When Australians start to roam



The coincidence last week of a deflationary Australian budget and Mr Holmes & Court's polite but aggressive letter to USX is not entirely accidental...

Siemens looks at BASF link

By David Brown in Frankfurt

SIEMENS, the West German electrical group, may take a significant holding in a new company combining the computer hardware and peripheral business of BASF...

UK plans to try gilts auctions

BY GEORGE GRAHAM IN LONDON

THE BANK of England plans a trial series of auctions of UK government securities, similar in style to the US Treasury bond auction...

Conrail to be sold by public offer

By William Hall in New York

THE US Government has acknowledged defeat in its bid to sell Conrail, the state-owned railway, to Norfolk Southern, a rival railway...

People Express grounds Frontier

THE CRISIS enveloping People Express, the aggressive low-cost American carrier, deepened yesterday after it was forced to ground its Frontier Airlines subsidiary...

Unions reject Montedison bid

The future ownership of Fermenta has become uncertain again as speculation grows that Mr El-Sayed is seeking to put together an alternative 'Swedish solution' to the Montedison takeover.

Cadbury stake in Dr Pepper

Canada Dry, with sales of \$242m and \$19.7m profits after tax but before extraordinary items in 1985, has almost 3 per cent of the North American soft drinks market while Dr Pepper, which made net profits of \$60m last year, has 1 per cent of the \$36m US soft drinks market.

Whether Mr Holmes & Court has bought shares in USX, time (and the SEC filing) will show. Whereas Wall Street has been looking at a strike-bound steel and energy company, whose share price is back at its 1982 level while the market has doubled, an Australian would be reminded of what BHP looked like three years ago.

British brewers

The spectre of an inquiry by Britain's Monopolies and Mergers Commission into the supply of beer in licensed premises has done notable injury to a sector of the market which had been high fashion.

SANWA INTERNATIONAL LIMITED advertisement with logo and contact information

World Weather table with columns for location, temperature, and other weather data

DOUGLAS CAPABILITY IN CONSTRUCTION

SECTION II - COMPANIES AND MARKETS FINANCIAL TIMES

Tuesday August 26 1986

AE GROUP EXTENDING THE FRONTIERS OF ENGINE COMPONENT TECHNOLOGY

Firestone more than doubles income

By William Hall in New York FIRESTONE Tire & Rubber, the second biggest US tyre manufacturer, yesterday reported more than doubled third-quarter net income of \$27m, or 70 cents a share, after including a \$6, or 15 cents a share, after-tax gain from the partial liquidation of inventories.

The group's sales fell 3 per cent to \$681m, and sales for the nine months to July 31 fell from \$2.83bn to \$2.89bn. Net income for the nine months totalled \$121m, or \$3.07, compared with \$50m, or \$1.18, last year. The nine-month figures include \$66m, or \$1.87, as a result of the recognition of previously deferred pension reversion gains.

Operating income in the third quarter totalled \$64m compared with \$34m. The latest period included a pre-tax gain of \$11m reflecting the partial liquidation of inventories. Operating income from the group's international tyre operations rose by 30 per cent to \$26m in the third quarter. Firestone's shares rose by 5 1/4 to \$2 3/4 in early trading on Wall Street yesterday.

DSM, the big Dutch state-owned chemical group, lifted first-half net income by 2.8 per cent to F1 217m (\$94.2m) from F1 211m a year earlier, AP-DJ reports from Heerlen.

Currency sector draws Eurobond investor interest

THE EUROBOND market saw a flurry of new issuing activity last week and syndicate managers should be kept busy over the coming weeks as a crop of deals, some for sovereign credits, are rumoured, writes Clare Pearson in London.

But the Eurodollar market seems unlikely to benefit from this surge in business. Investors' eyes are focused on the "currency" sectors of the market, despite the ambiguity of official statements out of Japan and West Germany on interest rate policy.

The US, on the other hand, has already taken the plunge with a 1/2 point cut in the discount rate last Wednesday night. This move surprised but did not impress the Eurobond market.

The cut came earlier than expected so the market did not have time to overreact itself in its anticipation. The hope of a further cut, however, is doing little to inspire dealers, given the flatness of the yield curve which implies longer-term bonds may not benefit from it.

This view is of little help to underwriters of a rash of new, longer-dated Eurodollar deals launched

early last week. Apart from a generously priced issue for Long-Term Credit Bank of Japan, most of these moved tortoise-like into the market. When a \$100m 10-year issue for Finland followed them in the aftermath of the discount rate cut, it met with a resounding chorus of indifference.

The difficulty of inspiring Eurobond market investors to purchase dollar bonds is driving more borrowers into the relatively more buoyant New York debt market. This alternative has been favoured by US corporates for some time, but sovereigns are increasingly tapping it for longer-term funds.

Such stalwart Eurobond market issuers as the World Bank, GMAC, Citicorp and Citibank are believed to have made the deliberate decision to issue in New York instead of going to Europe recently. There are rumours that Canada has been considering issuing in the Eurobond market for some time but has probably decided on the Yankee market instead.

But the "currency" sectors of the Eurobond market should see a flock

of new offerings soon. In the Euroyen market, for instance, a large deal from Norway is rumoured.

Meanwhile, in the sterling market a £150m bond for Britannia Building Society issued last Friday is expected to herald another crop of floating rate notes for UK building societies, with a very large issue thought likely to surface shortly.

The re-opened prospect of lower UK interest rates inspired a renewal of fixed-rate issuing activity in the sterling market last week, although the market came to grief last Thursday after the Bank of England had moved to quell pressure for an immediate cut in bank base lending rates.

Nevertheless, by then Trafalgar House, the UK construction, property and shipping concern, had been able to reopen the 20-year Eurosterling market, previously closed for the summer.

Trafalgar House's deal traded at around its issue price within or around its fees despite a subsequent downturn in the gilt market. But it also demonstrated that the long-term Eurosterling market re-

mains firmly on shore. Its price level was believed to have been sustained almost entirely by UK institutions, since continental investors continue to resist the prospect of a long-term sterling bond.

European investors are also reluctant to buy longer-dated Canadian dollar paper, dealers say. The 10-year area of the Canadian dollar market is now heavily oversupplied. Some deals are being supported at price levels around their fees, but others were sinking fast by the end of last week.

Longer-term financings are faring better in the D-Mark sector, which is inspired by the hope that the currency may test DM 2 against the dollar and that official interest rates will eventually be cut. Although the domestic bond market is gaining the most from this anticipation, a 30-year Eurobond for the World Bank gained a point last week.

Recent fixed rate D-Mark deals have met mixed receptions, but underwriters should be able to console themselves with the outstanding performance of equity related offer-

ings. Last Friday, for instance, a DM 150m 12-year bond for Kautbah, the department store group, hit a bid price of 137.17 points up on the week. Meanwhile Benetton, the Italian clothing company, was able to launch a DM 200m bond at par on Tuesday that was bid at 119 by Thursday.

Australian dollar bonds suffered a fresh burst of selling on Friday amid continuing negative reaction to the recent budget. Issues by Australian borrowers were particularly hard hit in the selling wave.

Peter Montagnon in London adds Gola (UK), a unit of Sweden's Gotalbanken, is to enter secondary market business in Eurobonds. It is hiring a team of three dealers headed by Mr Willy Brechtelmid away from Thomson McKinnon Securities.

A feature of the move is that all three dealers - the other two are Mr Klaus Gerlach and Ms Heather Jackson - have a longstanding association, having worked together at the old firm of Ross & Partners before it was taken over by Drexel Burnham Lambert.

That makes them seasoned operators. "I would like to have seasoned traders who know what a bear market is in the next couple of years," said Ms Annabelle Svoboda, Gola (UK) managing director. Properly staffed secondary market trading was an appropriate activity for a smaller house like Gola which could not for the time being aspire to a role in the primary market, she added.

EUROBOND MARKET TURNOVER Turnover (\$m) Primary Market Straight Cont. FRN Other

McLeod Young in search for investors

By Robert Gibbins in Montreal McLEOD Young Weir, one of Canada's largest investment banking and brokerage firms, is negotiating with several institutions wanting to buy a substantial interest in the company.

The Ontario Government is expected to ease the rules restricting outside ownership in brokerage firms by year-end, and McLeod Young wants a deal in place by then, said Mr Thomas Kiarans, president. Shearson Lehman Brothers, New York, part of American Express, already owns 10 per cent of McLeod, the maximum under prevailing rules. McLeod is talking to Shearson and two other Canadian institutions, but control will remain with the present senior management. The new outside ownership limit will be 30 per cent.

Wood Gundy and Gordon Capital, two large Canadian investment banks, this spring failed to find a basis for merger in advance of coming deregulation in the financial services industry while Dominion Securities is raising C\$100m (US\$72m) from the public.

Nesbitt Thomson also went the public issue route while several other brokerages have plans for increased foreign or Canadian institutional ownership.

Telelobe Canada, the federal Government's next privatisation project, is still subject to policy changes and another round of bidding is likely.

The Government has competed the sale of De Havilland to Boeing and Canadaair to Bombardier and has disposed to an ammunition maker and several smaller crown units. But Telelobe would be its biggest single privatisation step.

Ottawa originally asked for bids last year, and most proposals had expiry dates last October. Telelobe handles Canada's foreign telecommunications traffic to all countries except the US and Mexico.

Innovative credit facility launched by British building society

BRITISH building societies have been stepping up their borrowing activity in wholesale financial markets over the last couple of years, but they have not been particularly active for their innovation. Last week, however, National and Provincial of Bradford launched a credit facility with a difference in the sterling market, writes Peter Montagnon in London.

Led by Lloyds Merchant Bank the deal is a £100m, five-year advances facility which carries no underwriting back-up and in which participants have an obligation to bid each time the borrower seeks to draw. The catch is that there is no ceiling to the level at which they can bid for paper.

The deal is being handled separately from another £100m, five-year facility for the same borrower that

Lloyds also announced last week. This is a conventional transferable revolving credit carrying a margin of 5 basis points over the London interbank offered rate for sterling deposits and a commitment fee of 6 basis points payable only if less than two-thirds of the deal is drawn.

The margin is lower than on similar deals for other building societies but the borrower will absorb lenders' costs of maintaining reserve assets with the Bank of England.

This deal is designed to be heavily drawn and will not back up the advances facility, which is reminiscent of a dollar facility arranged for BAT Industries in the early days of the Eurozone market. That operation also bore no commitment fee and no maximum margins - and it proved highly controversial.

It remains to be seen whether National and Provincial's facility will arouse the same degree of debate, but one major change that has occurred between the two deals is that the market has become accustomed to fully uncommitted issues of commercial paper which carry no commitment fee.

Lloyds described the structure on Friday as a half-way house between a committed facility and an uncommitted one. The borrower is guaranteed availability of funds because each participant is committed to bid for paper. But it cannot rely on obtaining a particular price and would be vulnerable to high rates if market perception of its credit rating changed.

To combat this a further twist has been introduced which Lloyds describes as a Christmas bonus.

Banks will receive a fee at the end of the year varying between one and three basis points depending on the averaged weighted level of their bids for the paper. The highest fee will be paid if the average bid margin is less than 6 basis points, the lowest if it is between 9 and 12 and there will be no fee at all if it is higher than 12.

For the advances facility banks will have to absorb reserve asset costs themselves but Lloyds still reckons that the return to banks should be slightly higher when the bonus is taken into account than under a conventional facility structure.

Among other new deals Salomon Brothers is arranging a \$100m, five-year facility for Norwest Corporation, the Minneapolis holding company. The deal carries a facility fee

of 10 basis points, and drawings will bear interest at a margin of 12 1/2 basis points though there will be an additional utilisation fee of 10 basis points if more than half is taken.

Separately, Lloyds announced on Friday that its bankers acceptance facility for the Soviet Foreign Trade Bank had been increased to £150m from £100m.

The certificate of deposit programme for Mitsui Trust and Banking has also been increased to \$1.5bn from \$1bn because of its successful market reception while Morgan Stanley and S.G. Warburg have been appointed as additional dealers alongside Shearson Lehman, Salomon Brothers and Paine Webber. Banco de Bilbao is launching a \$75m certificate of deposit facility through Bank of America, believed to be the first such operation

for a Spanish bank. Bankers Trust will also be a dealer.

That leaves Asia as the main focus of activity in Eurocredits. As already reported, terms on Malaysia's \$550m deal were unveiled last week while Pakistan has agreed a 1 per cent margin on its five-year, \$100m credit led by Arab Banking, Chase Manhattan, Chemical and Gulf International Bank.

Bidding is now hotting up on the \$500m credit for India's Oil and Natural Gas Commission which is expected to carry a strong Japanese tax-spared element following a growing trend in Asian deals.

Though Korea has halted foreign borrowing till the end of September, some bankers in Hong Kong reckon that Korea Development Bank could be back for its long-awaited \$300m deal shortly thereafter.

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INTERNATIONAL CAPITAL MARKETS AND COMPANIES

Laura Raun on the strategy behind a rare Dutch takeover attempt

Unilever smells success in Naarden move

WHILE dramatic and costly takeovers of British and American companies have accelerated in recent years, far fewer Dutch companies have been snapped. The relative scarcity of Dutch takeovers makes Unilever's friendly and increasingly likely takeover of Naarden, the Dutch flavours and fragrances group, even more interesting.

Unilever, the Anglo-Dutch food and detergent conglomerate, looks set to go ahead in coming weeks with its contemplated public bid for the rest of Naarden that it does not already own. Negotiations over the mooted £150 million offer have continued even while Unilever has snapped up Naarden's shares. Yesterday Unilever said it had boosted its stake from 40 per cent to 49 per cent and said talks were going well. Under Dutch law, Unilever is not permitted to acquire more than 50 per cent of Naarden shares on the open market.

Naarden executives and shareholders heartily welcomed Unilever's advances during an

extraordinary shareholders' meeting on August 13 in the wealthy village of Naarden, south-east of Amsterdam. Paradoxically, the meeting was held to consider anti-takeover measures that were proposed in April — the exchange of common shares for non-voting share certificates and issue of preference shares with voting rights.

As it turned out, these "shark repellent" measures were approved anyway because they will be invoked only if the Unilever talks fail or if an unfriendly, competing bid is made. Unilever itself with its 1,458m shares purchased on August 18, cast the deciding votes, as perhaps explaining in part why it jumped into the market so quickly.

For Unilever, the £100m (\$149.9m) purchase of Naarden would be only peanuts compared with the £1bn failed offer for Richardson-Vicks of the US last year. It also comes as something of a surprise amid the belief that a US acquisition was still top priority. But both companies apparently expect to

benefit from the economies of scale derived from merging Naarden with Unilever's Savours and Finances unit, PFF International.

Naarden, like many Dutch companies, has fended off unwanted advances before, including a bid from Hoffmann-La Roche, the Swiss pharmaceuticals giant, Dutch companies value highly their operating independence, usually preferring to run their own business rather than taking instructions from a headquarter elsewhere.

Part of this independence arises from the Dutch character and its very high premium on individual freedom.

Family-owned companies often have carefully protected their integrity, avoiding going public entirely or ensuring firm control. The Heijn family retains some control over Ahold, the food-chain concern, through preference shares in a foundation, somewhat similar to Grundig of West Germany.

Douwe Egberts, the coffee and tobacco company, issued B shares some years ago in an attempt to preserve some family

control and the Dutch character of the concern. Although Douwe Egberts was fully taken over by Sara Lee of the US, the Dutch company clearly maintains its own identity.

An 80-year-old, publicly traded company, Naarden, too, is keen to preserve its independence and is sure to press the point in negotiations with Unilever. As a Naarden executive emphatically put it: "We're not interested in asset-strippers like some of the American companies."

Many Dutch companies already boast large operations abroad and export heavily, obviating the need to merge to achieve a better geographical spread. The small, domestic market has forced them to sell abroad and import many raw materials just to survive.

Yet another factor is the great weight which Dutch managers give to labour relations. Asset-strippers are just the sort of companies that make union members fear for their jobs. Management's desire to keep workers happy has more to do with the Dutch desire

Group Five turnover falls 20%

GROUP FIVE, one of South Africa's largest construction companies, suffered a 20 per cent decline in turnover during the first half of the year as the number of contracts available shrank, writes Jim Jones in Johannesburg.

The company continued to suffer operating losses and has closed down several loss-making divisions.

The first half's turnover dropped to R202m (\$78m) from R251m in the first half of 1987, the operating loss before finance charges and tax was R8.7m against the previous year's first-half profit of R2.6m and the interim pre-tax loss was R11m against last year's R1.2m interim loss. In 1987 as a whole, turnover was R498m, the operating loss was R23m and the pre-tax loss was R13.4m.

All the non-construction operations have, or are being sold and emphasis is being placed on preserving the core divisions operating on the construction and civil engineering sectors.

The first half has resulted in a loss of 71.8 cents a share.

NEW INTERNATIONAL BOND ISSUES

Borrower	Amount	Year	Av. life	Coupon	Price	Book Runner	Offer yield
	m.		years	%			%
U.S. DOLLARS							
Wako Securities Ltd	50	1991	5	2 3/4	100	Wako Int. (Europe)	2.875
Bank of Tokyo (Int) Ltd	100	1993	7	7 1/4	100 3/4	Societe Generale	7.587
De Nat. Investeringsspaak	100	1996	10	7 1/4	101 1/2	Banque Paribas	7.585
IADB	200	1998	10	7 3/4	100 1/2	Deutsche BA Cap. Mkts	7.582
LTCS of Japan	150	1999	10	8	101 1/2	LTCS Int.	7.778
Bank of Hawaii	200	1994	8	3 1/2	100	Banque Paribas	—
Auro Bank	100	1996	10	3 1/2	100	ESB Auro Bank	3.500
Credit Chimique	50	1996	10	6	100	Morgan Stanley	—
American Express	100	1993	7	7 1/4	100 3/4	Shearson Lehman Bros.	7.463
World Bank (Int) Ltd	100	1993	7	7 1/4	100 3/4	Shearson Lehman Bros.	7.587
American Express (Int) Ltd	250	2016	30	8 1/2	89	Morgan Stanley	8.515
Shearson Lehman (Int) Ltd	300	1999	10	10 1/2	100	Shearson Lehman Bros.	—
Fujita Corp.	70	2001	5	(3 3/4)	100	Nomura Int.	—
Yamaha Motor	100	1991	5	(3 3/4)	100	Nomura Int.	—
Asahi Chemical	50	1991	5	(3 3/4)	100	Yamashita Int. (Eur)	—
Finland	100	1998	10	7 1/4	101 1/2	Nikka Secs. (Europe)	7.425
Headsche Landeshank	100	1990	10	0	100	LTCS Int.	—
B. P. Corp.	50	1991	5	(2 3/4)	100	Bilbao Europe	—
D. P. Corp.	20	1991	5	(2 3/4)	100	Nikka Secs. (Europe)	—
CANADIAN DOLLARS							
Canadian Nat. Railway	100	1996	10	9 1/2	101 1/4	McLeod Young Weir	8.178
Philip Morris	100	1990	3 1/2	8 1/4	100 1/2	Morgan Guaranty	8.914
Vicat Corp.	75	1996	10	10 1/4	101 1/4	CIBC Ltd.	8.699
D-MARKS							
BHF-Bank Finance	150	1998	12	6 1/4	111	BHF-BANK	4.411
Hort. Bk. of Hungary	150	1990	10	0 1/2	100 3/4	WestLB	8.822
Banquet Int.	280	1993	7	2	100	CSFB-EHezanbank	2.000
Hercules Int.	75	1990	10	0 1/4	100	Deutsche Bank	0.250
SWISS FRANCS							
ETE Finance (Int) Ltd	50	2006	—	6 1/2	100	Sudic	8.580
Migros-Thurgau	50	1991	—	7 1/4	(100)	Banca del Gottardo	8.750
Cramer Corp. Fin.	150	1991	—	—	—	Sudic	—
Sarasin Electric	80	1991	—	(1)	—	Credit Suisse	—
Tokyo Electric Power	200	1991	—	(14 1/2)	—	Credit Suisse	—
Fujita Corp.	100	1991	—	11	100	Credit Suisse	—
Mitsubishi of Tokyo	100	2006	—	5 1/4	99 3/4	SBC	5.145
ECSC	41.2	1991	—	4 3/4	100	SBC	4.758
Rohm Co.	100	1991	—	11 1/4	—	HBS	—
Rohm Co.	100	1993	—	(1 1/4)	—	HBS	—
A/S Nipi	50	1991	—	4 1/2	100	Credit Suisse	4.875
Pegasus Gold Corp. (Int)	50	1996	—	5 1/4	100	Bog Gutzwiller, K. B.	5.750
STERLING							
Trafalgar House	100	2006	20	10 1/4	100 1/4	Kleinwort Benson	18.594
Dresdner Bank	50	1991	5	9 1/2	100 3/4	BZW	0.306
Britannic B. Soc. (Int) Ltd	150	1996	10	10 1/2	100	Hambros Bank	—
FRENCH FRANCS							
Stetel (Int) Ltd	750	1993	7	1/2	100.1	BNP	—
CHILDRENS							
ARN	100	1991	5	5 1/4	100	ARN	5.750
KCM P. macarons	50	1994	0	0	100	Van Herten and Co.	0.800
DANISH KRONER							
Denmark	500	1991	5	9 1/2	101	Privatbanken	5.490
YEN							
Kawasaki Steel (Int) Ltd	100m	1996	10	(c)	100	Nomura Int.	—
Sweden	200m	1995	9	5 1/4	101 1/2	Daiwa Europe	5.410

Elkem slides further into the red at six months

ELKEM, the Norwegian metals, mining and manufacturing concern, reports a further deterioration of results in the second quarter of 1988, bringing group losses for the half-year to Nkr 98m (\$13.4), compared with a profit, before extraordinary items, of Nkr 258m a year earlier.

Turnover dropped to Nkr 3.7bn, from Nkr 4.74bn, reflecting continuing low prices for the group's main products — aluminium, silicon and ferro alloys — coupled with the effects of a week-long industrial dispute in April.

The 12 per cent devaluation of the Norwegian krone in May had an immediate negative impact on Elkem's accounts, by boosting financial costs. However, it also increases kroner income from exports, and over the year as a whole this is expected to offset the initial rise in financial costs.

The report says that there are still no signs of a likely general price improvement for the metals it produces, but notes that, despite the difficult

Interim profits setback at Beijer

INVESTMENT BEIJER, the Swedish diversified holding company, said pre-tax profits fell 20 per cent to Skr 197m (\$28.6m) in the first half of 1988 from Skr 247m a year earlier, APJID reports from Stockholm.

Despite a 38.4 per cent increase in the general stock market index, its portfolio of listed shares only increased 19.8 per cent during the period because of a steep drop in the share price of Fermenta, the biotechnology company. The market value of Beijer's portfolio rose to Skr 3.22bn at the end of June from Skr 2.82bn at the beginning of the year.

For the full year, Beijer forecast that pre-tax profits would fall to Skr 250m from Skr 435m in 1988. The forecast was adjusted upwards from expectations of a Skr 180m full-year profit stated in May.

Beijer group sales increased 29 per cent in the first half to Skr 710m from Skr 551m in the year-earlier period.

Fruehauf agrees \$1.12bn Merrill Lynch-led buyout

FRUEHAUF, the US five-month long battle for control of Fruehauf, the US automotive parts and truck company, ended with the Detroit group agreeing to a sweetened \$1.12bn leveraged buy-out bid led by Merrill Lynch, the Wall Street securities firm, and Fruehauf's senior managers.

As a part of the deal, which came after two days of intense negotiations, another investor group led by Mr Asher B. Edelman, dropped its hostile counter bid but will emerge from the battle with a large profit. As part of the deal the Merrill Lynch-led group agreed to acquire the 2.1m shares accumulated by the Edelman group for \$49 a share, representing a profit of about \$30m, and to reimburse \$21m in Edelman expenses.

The Merrill Lynch-led group will pay shareholders \$49.50 a share in cash for 71 per cent of Fruehauf and acquire the remaining shares with a package of securities, including preferred and common stock, which analysts valued at about \$48.75. Earlier Merrill Lynch had been offering \$48.50 in cash and securities for Fruehauf while the Edelman group had appeared close to winning the bid battle with a complex \$49.50 a share bid for 51 per cent of the stock and proposed acquiring the rest of the company with a package of securities with a face value of \$51 a share.

The deal signals the end of a long and sometimes bitter battle for control of Fruehauf, which began in March. Once the buyout is complete, Fruehauf is expected to shed some of its assets, perhaps its aerospace and finance subsidiaries, to help pay back debt.

Anderson, Clayton, the US food group which has rejected a bid from Bear Stearns and Guss & Co, two US investment banks, is commencing a tender offer to buy up to 8m of its outstanding common shares at \$60 each in cash, for a total of \$480m. This represents a \$34m increase over the cash distribution to public stockholders involved in the company's now withdrawn recapitalisation plan.

This announcement appears as a matter of record only.

AUGUST 1986

U.S. \$55,000,000

Great American Credit Services, Inc.

Revolving Credit Facility

Guaranteed by

Great American First Savings Bank

Arranger

Credit Suisse First Boston Limited

Participants

Banco de Bilbao S.A.	The Bank of Tokyo, Ltd.
Bank Brussel Lambert N.V.	Banque Nationale de Paris
Banque Paribas	Credit Agricole
Crédit du Nord	
First Interstate Capital Markets Limited	Kansallis Banking Group
National Australia Bank	The Sanwa Bank, Ltd.

Facility Agent

Credit Suisse First Boston Limited

This announcement appears as a matter of record only.

New Issue

7th May, 1986

U.S. \$100,000,000

Union Pacific Corporation

7 1/2 per cent. Notes due 1996.

Issue Price 99 3/4 per cent.

Union Bank of Switzerland (Securities) Limited

Bank of Tokyo International Limited	Banque Bruxelles Lambert S.A.
Barclays Merchant Bank Limited	Chemical Bank International Limited
Crédit Commercial de France	Crédit Lyonnais
Daiwa Europe Limited	Deutsche Bank Capital Markets Limited
Generale Bank	IBJ International Limited
Kleinwort, Benson Limited	Kredietbank International Group
Kuwait International Investment Co. s.a.k.	Kuwait Investment Company (S.A.K.)
Morgan Grenfell & Co. Limited	Morgan Guaranty Ltd
The National Commercial Bank-Jeddah	The Nikko Securities Co., (Europe) Ltd.
Banca del Gottardo	Genossenschaftliche Zentralbank AG-Vienna
Leu Securities Limited	Swiss Volksbank

UK COMPANY NEWS

Yorkshire-TV should make a good debut

BY RICHARD TOMKINS

Yorkshire Television, the last of the major television contractors to seek a stock market quotation, today publishes the prospectus for an offer for sale which will value it at £41.2m.

Some 8.2m shares — 25 per cent of the equity — are being sold at 125p a share by the company's four major shareholders. These are Bass, W. H. Smith, FL Publishing (a subsidiary of Pearson, which also owns the Financial Times) and Yorkshire Post Newspapers.

Bearing Brothers, the merchant bank, is sponsoring the issue and Cazenove is the broker. Yorkshire is coming to the market on a profits forecast of £8.25m for the year to September 30 1986, compared with

£3.6m last time, putting the shares on a prospective price/earnings multiple of 8.4. On the forecast dividend of 6.25p, the yield will be 7.04 per cent. The prospectus also highlights Yorkshire's programme-making record and draws attention to praise from the Independent Broadcasting Authority for programmes such as First Tuesday, From The Cradle To The Grave, Harry's Game, and The Beiderbecke Affair.

comment Simple mathematics dictates that if there is any logic in the stock market at all, Yorkshire Television's issue must be a success. There is little to distinguish the company from the other ITV majors, yet the issue is pitched at a price which leaves it at a significant discount to the average for Thames, Central and LWT.

Standard Chartered dismisses bid talk

By John Edwards

Press reports that the Australian banking group Westpac was planning a take-over bid for Standard Chartered Bank were "entirely speculative" and had "little credibility," according to Mr Michael McWilliam, Standard's group managing director.

Mr McWilliam said yesterday that he had no evidence of any planned bid, and it seemed an implausible idea bearing in mind the respective sizes of the two groups and the present weakness of the Australian dollar.

At the moment Australian banks generally were not in a good position to do anything overseas since their main problem was coping with their weak domestic currency. So the story made little sense, he added.

Ayrshire Metal improving after £0.3m interim loss

Reflecting depressed conditions throughout most of the first half of 1986, the results of Ayrshire Metal Products showed a downturn of £725,000 to a loss of £399,000.

The directors halved the interim dividend to 0.5p net and said the full year's payment would be considered on the basis of the second half performance. In the year 1985 the group made a profit of £780,000 and paid a final of 1p.

With short lead times at each of the companies' operations, forecasting remained difficult, the directors said. But at the end of July the group was operating at a modest profit.

engineering and steel fabrication group said they carried out a critical appraisal of the cost structure and that led to a 10 per cent reduction in numbers employed and annual cost savings in excess of £400,000.

The industrial buildings market, served by the Daventry company, was showing signs of increased activity after the downturn last autumn. At St Helens the factory was busy, but poor batch quantities and reduced margins were providing lower than anticipated profits.

Sales in the 24 weeks ended June 15 1986 came to £8.34m (£9m) with the UK contribution down to £7.98m (£8.68m).

PENDING DIVIDENDS

Dates when some of the more important company dividend statements may be expected in the next few weeks are given in the following table. The dates shown are those of last year's announcements except where the forthcoming board meetings (indicated thus) have been officially notified. Dividends to be declared will not necessarily be at the amounts in the column headed "Announcement last year."

Table with columns: Company Name, Date, Announcement last year, Dividend, and Remarks. Includes companies like AMEC, Assog, BHP, BT, etc.

Network Security profit doubled

Network Security Corporation, the 26.5 per cent owned associate of Automated Security Holdings, has announced interim profits more than doubled at \$4.7m (£3.1m) against \$2.2m on turnover of \$30.3m.

Holographics expansion plan

At the annual meeting of Applied Holographics the chairman confirmed that production of foils was set to start next February.

informed that the company was in the advanced stage of the acquisition of a UK concern which would complement the marketing effort in foil sales. The chairman said orders for many millions of reflection holograms were in an advanced state of negotiation with major companies in the UK, Switzerland and the US.

Sirdar moves into curtain making

Sirdar, the hand-knitting yarn maker, has moved into the manufacture of ready made curtains through the acquisition of Eversure Textiles for an initial \$5m cash.

Mr David Woskow is staying on as chief executive. The executive directors are to remain and will be joined by Mr F. G. Lunn and Mr J. Stuart of Sirdar.

Arthur Wood in profit

A considerable improvement in demand enabled Arthur Wood & Son (Leopold) to return to the black in the first half and produce a profit of £53.814.

Turnover in the 1986 period came to £21.72m (£17.2m). After tax £21,300 (nil) earnings were shown at 1.56p (loss 0.65p) per share.

F.T. Share Information The following securities have been added to the Share Information Services: Alsprung (Section: Industrials) Campbell & Armstrong (Industrial) Kleinwort Development Fund (Investment Trusts) Nationwide Soc (Loans, Building Societies) Space Planning Services (Paper, Printing & Advertising) Tibbett & Britten (Drapery & Stores)

BOARD MEETINGS

Table listing board meetings for various companies including Anglo-American, Anglo-Continental, Anglo-Indo-China, etc.

Oil and Gas Technology Projects

Funds are available from the Commission of the European Community for projects which promote new technology in exploration, production, transport or storage of oil and gas. The monies become repayable only if the project is exploited commercially and may cover up to 40% of the total cost.

Application form for Oil and Gas Technology Projects, including fields for Name, Company, Address, and contact information.

EDF Electricite de France

US\$300,000,000 Floating Rate Notes due 1997 with Warrants permitting exchange of Notes for ECU-denominated 94% Bonds due 1995. Notes and Bonds unconditionally guaranteed by THE REPUBLIC OF FRANCE.

GRANVILLE

Table showing Granville & Co. Limited share performance with columns for Capitalization, Company, Price, Change, Gross Yield, P/F, and Fully Paid.

COMPANY NEWS IN BRIEF

ROCKWOOD HOLDINGS' 2.37m rights issue at 85p per share has been taken up as to 2.35m (about 99.2 per cent). This includes the rights of W. Canning, its holding company, to 2.03m which were taken up by a group of investors. Balance has been sold at 86p per share, and the proceeds will be distributed among the original allottees who have not taken up their rights. The shares are traded on the USSE.

Advertisement for Sheppards, Pelly and Alford, featuring the text 'For 159 years we've been searching for the perfect name. Now the chase is off.' and 'We've been called some curious things in our time. (These are just edited highlights.) However, as people insist on calling us by our first name only, we thought we'd bow to their judgement and make it official. From today, we will be known simply as Sheppards.'

Advertisement for The Bank of Tokyo, Ltd., Portland Branch, offering US\$10,000,000 Callable Negotiable Floating Rate Certificates of Deposit due December 9, 1986.

Advertisement for SOUTH CAROLINA NATIONAL CORPORATION, offering 6% Convertible Subordinated Debentures due 2001.

Advertisement for Banque Indosuez, offering Floating Rate Notes Due 1991 with an interest rate of 9 7/8% per annum.

Advertisement for Chemical New York Corporation, offering Floating Rate Subordinated Notes Due 1996 with an interest rate of 10 1/2% per annum.

Advertisement for Kingdom of Spain, offering US\$375,000,000 Floating Rate Notes Due 2005.

Table titled 'FINANCIAL TIMES STOCK INDICES' showing indices for Government Secs, Fixed Interest, Ordinary, Gold Mines, FT-100, and FT-SE 100.

Credit Suisse First Boston Limited Agent Bank

Credit Suisse First Boston Limited Agent Bank

LADBROKE INDEX 1,271,277 (+4) Based on FT Index Tel: 01-427 4411

John is ill

Financial Times Tuesday August 26 1986 LONDON RECENT ISSUES

AUTHORISED UNIT TRUSTS

FT UNIT TRUST INFORMATION SERVICE

Table with columns: Name, Unit Price, % Change, etc. Includes entries like Abbey Unit Trust, Brown Shipley & Co Ltd, etc.

Table with columns: Name, Unit Price, % Change, etc. Includes entries like Abbey Water Unit Trust, Arden Securities Ltd, etc.

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Renunciation date usually last day of trading for a company. A renounced dividend is a dividend on a company's shares which is not paid to shareholders who do not register their shares before the renunciation date.

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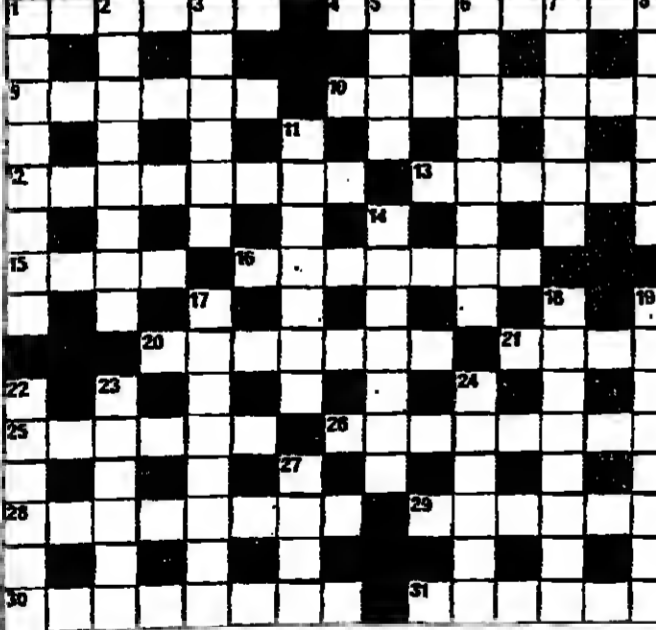
Play it safe. Look for the initials MOPS. For full details send a 9x6 stamped addressed envelope to: The National Newspaper, Mail Order Protection Scheme, 16 Tooks Court, London EC4A 1LB.

Table with columns: Name, Unit Price, % Change, etc. Includes entries like Abbey Unit Trust, Brown Shipley & Co Ltd, etc.

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FT CROSSWORD PUZZLE No. 6108 ORIGAMI



- ACROSS
1 You French kissers show up well in a bed (6)
4 Put lid of fashion buck with bloomer (8)
9 Direction to a little turnip - rise! (6)
10 Face split by left to chin with practice in the garden (8)
12 Has crop of restless footballers included (8)
13 Alyssum cultivation pointless in hospital (6)
15 Oriental hide-away or garden (4)
16 A revolutionary zeal as often found in the border? (7)
20 Ran into clipped bush (7)
21 Found in the King's head followed by a drunk (4)
25 Make trip around hospital and look for insects (6)
26 Plant right in peat to engineers direction (8)
28 Plum cases - a can of metal (6)
29 Cut branch meeting with American before a passage is covered (8)
30 Garden produce is shared around (8)
31 The colour of a Negro? (6)

Table with columns: Name, Unit Price, % Change, etc. Includes entries like Abbey Unit Trust, Brown Shipley & Co Ltd, etc.

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The solution to last Saturday's prize puzzle will be published with names of winners next Saturday.

AUTHORISED UNIT TRUSTS & INSURANCES

Table listing various insurance and unit trust products, including Waverley Asset Management Ltd, City of Edinburgh Life Assurance, and others, with columns for company name, address, and financial data.

Table listing various insurance and unit trust products, including Hill Sumner Life Assur. Ltd, M & S Group, and others, with columns for company name, address, and financial data.

Table listing various insurance and unit trust products, including National Provident Institution, Norwich Union Asset Management Ltd, and others, with columns for company name, address, and financial data.

Table listing various insurance and unit trust products, including Scottish Life Assurance Co Ltd, Scottish Widows' Group, and others, with columns for company name, address, and financial data.

Table listing various insurance and unit trust products, including Scottish Mutual Assurance Society, Scottish Widows' Group, and others, with columns for company name, address, and financial data.

INSURANCES

Table listing various insurance products under the 'INSURANCES' section, including AA Friendly Society, Abbey Life Assurance Co Ltd, and others, with columns for company name, address, and financial data.

Table listing various insurance products, including Colonial Mutual Group, Commercial Union Group, and others, with columns for company name, address, and financial data.

Table listing various insurance products, including Imperial Life Ass. Co of Canada, Imperial Life (UK) Ltd, and others, with columns for company name, address, and financial data.

Table listing various insurance products, including Pioneer Mutual Insurance Co Ltd, Property Equity & Life Ass. Co Ltd, and others, with columns for company name, address, and financial data.

Table listing various insurance products, including Scottish Widows' Group, Scottish Mutual Assurance Society, and others, with columns for company name, address, and financial data.

Vertical text on the left margin: 'YOU of th tripp favo head: swit' to 't bank. Test. area. varia. m. river. He walk. re. turbe. of. f. good. term. if. the. a. been. St. ha. de. fac. not. er. G. n. fa. n. m. is. r.

Self is Ltd

INSURANCE, OVERSEAS & MONEY FUNDS

Table of insurance and overseas funds, including Standard Life Assurance Co, UK Provident, and various international investment funds.

Table of insurance and overseas funds, including British Int'l Investment Mgmt Ltd, Fidelity International, and various international investment funds.

Table of insurance and overseas funds, including Schroder Mgt Services, Warburg Investment Management, and various international investment funds.

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Table of insurance and overseas funds, including Schroder Mgt Services, Warburg Investment Management, and various international investment funds.

Money Market Bank Accounts

Table of money market bank accounts, including The Charities Deposit Fund, The Money Market Trust, and various bank accounts.

Money Market Trust Funds

Table of money market trust funds, including The Charities Deposit Fund, The Money Market Trust, and various trust funds.

Money Market Bank Accounts

Table of money market bank accounts, including The Charities Deposit Fund, The Money Market Trust, and various bank accounts.

TRADITIONAL OPTIONS

Table of traditional options, including 3-month call rates, and various option contracts.

BRITISH FUNDS

Table of British Funds with columns for Name, Price, Last, and Yield. Includes sections for 'Shorts (Lives up to Five Years)', 'Five to Fifteen Years', and 'Over Fifteen Years'.

Updated

Small table of updated fund prices and yields.

Index-Linked

Table of Index-Linked funds.

INT. BANK AND O'SEAS GOVT STERLING ISSUES

Table of International Bank and Overseas Government Sterling issues.

CORPORATION LOANS

Table of Corporation Loans.

COMMONWEALTH & AFRICAN LOANS

Table of Commonwealth and African Loans.

Building Societies

Table of Building Societies.

Public Board and Ind.

Table of Public Board and Industrial funds.

Financial

Table of Financial funds.

FOREIGN BONDS & RAIFLS

Table of Foreign Bonds and Raifls.

AMERICANS

Table of American funds.

AMERICANS - Cont.

Continuation of American funds table.

CANADIANS

Table of Canadian funds.

BANKS, HP & LEASING

Table of Banks, HP & Leasing funds.

BEERS, WINES & SPIRITS

Table of Beers, Wines & Spirits funds.

BUILDING, TIMBER, ROADS - Cont.

Continuation of Building, Timber, Roads table.

DRAWERY & STORES - Cont.

Continuation of Drawery & Stores table.

CHEMICALS, PLASTICS

Table of Chemicals and Plastics funds.

DRAWERY & STORES

Table of Drawery & Stores funds.

LONDON SHARE SERVICE

BUILDING, TIMBER, ROADS - Cont.

Continuation of Building, Timber, Roads table.

DRAWERY & STORES - Cont.

Continuation of Drawery & Stores table.

ELECTRICALS

Table of Electricals funds.

CHEMICALS, PLASTICS

Table of Chemicals and Plastics funds.

DRAWERY & STORES

Table of Drawery & Stores funds.

FOOD, GROCERIES, ETC

Table of Food, Groceries, etc funds.

HOTELS AND CATERERS

Table of Hotels and Caterers funds.

INDUSTRIALS

Table of Industrials funds.

ENGINEERING

Table of Engineering funds.

ENGINEERING - Continued

Continuation of Engineering funds table.

INDUSTRIALS - Continued

Continuation of Industrials funds table.

HOTELS AND CATERERS

Table of Hotels and Caterers funds.

INDUSTRIALS

Table of Industrials funds.

ENGINEERING

Table of Engineering funds.

HOTELS AND CATERERS

Table of Hotels and Caterers funds.

INDUSTRIALS

Table of Industrials funds.

ENGINEERING

Table of Engineering funds.

HOTELS AND CATERERS

Table of Hotels and Caterers funds.

Journalist

INDUSTRIALS—Continued

Table of industrial stocks including companies like British Petroleum, Shell, and ICI, with columns for price, change, and volume.

LEISURE—Continued

Table of leisure stocks including companies like British Airways, British Telecom, and British Gas.

PROPERTY—Continued

Table of property stocks including companies like British Land, Granada, and News International.

INVESTMENT TRUSTS—Cont.

Table of investment trusts including various funds like British American and British Overseas.

FINANCE, LAND—Cont.

Table of finance and land stocks including companies like City of London and City of Westminster.

MOTORS, AIRCRAFT TRADES

Table of motor and aircraft trade stocks including companies like British Leyland and British Aerospace.

Motors and Cycles

Table of motor and cycle stocks including companies like Honda and Yamaha.

Commercial Vehicles

Table of commercial vehicle stocks including companies like Leyland and Daimler.

Components

Table of component stocks including companies like Lucas and Lucas Industries.

Garages and Distributors

Table of garage and distributor stocks including companies like Halfords and Halfords Stores.

NEWSPAPERS, PUBLISHERS

Table of newspaper and publisher stocks including companies like News International and Newsprint.

PAPER, PRINTING, ADVERTISING

Table of paper, printing, and advertising stocks including companies like Newsprint and Newsprint.

SHIPPING

Table of shipping stocks including companies like British Overseas Airways and British Overseas Airways.

SHOES AND LEATHER

Table of shoes and leather stocks including companies like Debenhams and Debenhams.

SOUTH AFRICANS

Table of South African stocks including companies like Anglo American and Anglo American.

TEXTILES

Table of textile stocks including companies like J. & J. Textiles and J. & J. Textiles.

TOBACCO

Table of tobacco stocks including companies like British American Tobacco and British American Tobacco.

TRUSTS, FINANCE, LAND

Table of trusts, finance, and land stocks including various funds and companies.

OVERSEAS TRADERS

Table of overseas trader stocks including companies like British Overseas Airways and British Overseas Airways.

PLANTATIONS

Table of plantation stocks including companies like British Overseas Airways and British Overseas Airways.

INSURANCES

Table of insurance stocks including companies like British Overseas Airways and British Overseas Airways.

PROPERTY

Table of property stocks including companies like British Land and British Land.

LEISURE

Table of leisure stocks including companies like British Airways and British Airways.

FINANCE, LAND—Cont.

Table of finance and land stocks including companies like City of London and City of Westminster.

MINES—Continued

Table of mine stocks including companies like Anglo American and Anglo American.

INSURANCES

Table of insurance stocks including companies like British Overseas Airways and British Overseas Airways.

PROPERTY

Table of property stocks including companies like British Land and British Land.

LEISURE

Table of leisure stocks including companies like British Airways and British Airways.

FINANCE, LAND—Cont.

Table of finance and land stocks including companies like City of London and City of Westminster.

MINES—Continued

Table of mine stocks including companies like Anglo American and Anglo American.

Notes and miscellaneous information regarding the stock market and company performance.

Regional and Irish stocks section with a list of companies and their prices.

Recent issues and rights page 31, providing information on company announcements.

THIS NOTICE IS IMPORTANT AND REQUIRES THE IMMEDIATE ATTENTION OF HOLDERS OF BONDS. IF HOLDERS ARE NOT SURE OF THE CORRECT ACTION THEY SHOULD TAKE THEY SHOULD CONSULT THEIR STOCKBROKER, LAWYER, ACCOUNTANT OR ANY OTHER PROFESSIONAL ADVISER WITHOUT DELAY.

NZI OVERSEAS FINANCE N.V.

Notice to the holders of the outstanding US\$50,000,000 10 1/2 per cent. Guaranteed Convertible Bonds Due 1994 denominated in US Dollars ("the Bonds") convertible into ordinary shares of NZI Corporation Limited ("Ordinary Shares").

Conversion Right Expiry Date: 20th October, 1986 Redemption Date: 27th October, 1986

NOTICE OF REDEMPTION

NOTICE IS HEREBY GIVEN to the holders of the outstanding Bonds that, in accordance with the Conditions endorsed on the Bonds ("the Conditions") and pursuant to the provisions of the Trust Deed dated 1st November, 1984 ("the Trust Deed") between the Company of the one part and NZI Corporation Limited of the second part and the Trust Deed between the Company of the one part and NZI Corporation Limited of the second part and the Trust Deed between the Company of the one part and NZI Corporation Limited of the second part...

RIGHTS OF CONVERSION

Holders of Bonds are reminded that they may exercise the right to convert the principal amount of his Bond(s) into Ordinary Shares not later than 20th October, 1986.

Bonds may be converted into Ordinary Shares at the Conversion Price of NZ\$1.32 per Ordinary Share which using the fixed exchange rate specified in the Conditions of NZ\$1=US\$0.4671 results in a conversion rate of 1655.2778 Ordinary Shares for each US\$1,000 principal amount of Bonds.

As provided in the Conditions, any holder of Bonds who wishes to exercise his right to convert must obtain a Conversion Notice from the specified office of any Conversion Agent (set out on the reverse of the Bonds and at the foot of this Notice), complete and sign the same in accordance with the instructions thereon and deliver it with his Bond(s), together with all unexpired Coupons, at the specified office of any Conversion Agent at any time up to the close of business on 20th October, 1986.

On 11th August, 1986 the Current Market Price (as defined in the Trust Deed) of the Ordinary Shares on the New Zealand Stock Exchange was NZ\$1.85 per Ordinary Share (which converted into US Dollars at the rate of exchange on 8th August, 1986 is equivalent to US\$0.966). At such price, the holder of a Bond of US\$1,000 principal amount would receive upon conversion Ordinary Shares having a value of US\$1,503.096. Such value is, however, subject to variation with both the market value of the Ordinary Shares, and any fluctuation in the rate of exchange between US Dollars and NZ Dollars.

SO LONG AS THE MARKET VALUE OF ORDINARY SHARES IS NZ\$1.34 OR MORE (AND ASSUMING NO ADVERSE MOVEMENTS IN THE AFORESAID RATE OF EXCHANGE), HOLDERS OF BONDS WILL UPON CONVERSION RECEIVE ORDINARY SHARES HAVING AN AGGREGATE GREATER MARKET VALUE THAN THE CASH WHICH THEY WOULD RECEIVE ON REDEMPTION OF THEIR BONDS. FAILURE TO DELIVER BONDS FOR CONVERSION ON OR BEFORE 20TH OCTOBER 1986 WILL AUTOMATICALLY RESULT IN REDEMPTION AT A PRICE (INCLUDING ACCRUED INTEREST) OF US\$1,055.37 FOR EACH US\$1,000 PRINCIPAL AMOUNT OF BONDS.

Value of the Ordinary Shares into which each US\$1,000 principal amount of Bonds is convertible based on the Current Market Price of the Ordinary Shares on the New Zealand Stock Exchange on 11th August, 1986 (converted into US Dollars on the basis referred to above) of US\$1,503.096 per Ordinary Share. US\$1,503.096 Redemption price (including accrued interest) for each US\$1,000 principal amount of Bonds. US\$1,055.37

If any holder of Bonds wishes to accept redemption at the redemption price (including accrued interest) he should surrender his Bond(s) together with all unexpired Coupons at the specified office of any Paying Agent (set out on the reverse of the Bonds and at the foot of this Notice) on or after 27th October, 1986.

The attention of holders of the Bonds is drawn to the Conditions and in particular to Conditions 5 and 7 which contain further details regarding redemption and conversion. Copies of the Trust Deed are available for inspection at the registered office of the Trustee at Estates House, 66 Gresham Street, London EC2V 7HX and at the offices of the Paying Agents and Conversion Agents specified below.

PRINCIPAL PAYING AGENT

Citibank, N.A., Citibank House, 338 Strand, London WC2R 1JB

PAYING AGENTS

- Citibank, N.A., Citicenter, 92073 Paris la Defense, Luxembourg. Citibank, N.A., Herengracht 545/549, Amsterdam. Citibank, N.A., Neue Mainzer Strasse 40/42, D-6000 Frankfurt/Main 1.

Diamond Shamrock ends its search

By William Hall

DIAMOND SHAMROCK, the Dallas-based energy group which recently slashed its dividend following the collapse in oil prices, has ended its six-month search for a new chief for its exploration and production operations. It has appointed Mr Charles L. Blackburn, 58, to be president of Diamond Shamrock Exploration Company.

Meanwhile, Mr Jack E. Little, a senior vice-president of Shell, has been promoted to executive vice-president. He succeeds Mr Blackburn, one of three executive directors of Shell Oil and head of its worldwide exploration and production operations. He will fill a vacuum at the top of Diamond Shamrock, which has been searching for a new exploration chief since March when it announced it was consolidating its international and domestic exploration companies and dismissed Mr C. Dale McDoulet, the two executives running the exploration operations.

They have left Diamond Shamrock, with several other executives including Mr J. L. Jackson, the group's president, who resigned last month. Diamond Shamrock is in the process of selling its coal and chemical businesses and concentrating on its oil and gas businesses.

New head for Gotabanken

By Sara Webb in Stockholm

MR SVEN ERIK RAGNAR, one of five managing directors at Skandinaviska Enskilda Banken, the leading Swedish bank, has been appointed president and chief executive of Gotabanken. Gotabanken is the fourth largest commercial bank in Sweden. The top post has been vacant since the resignation of Mr Hans Mikaelsson for personal reasons. Mr Ragnar will take up office on October 1.

INTERNATIONAL APPOINTMENTS

Former office junior in line to take top job at K Mart

BY WILLIAM HALL IN NEW YORK

MR JOSEPH E. ANTONINI, who joined K Mart, the second-biggest US retailer, as a stock boy 22 years ago, has been appointed president and chief operating officer, putting him in line to succeed Mr Bernard M. Fauer as chief executive, when Mr Fauer retires at the end of next year.

Mr Antonini has worked his way through the ranks of the company. Last January he was appointed an executive vice-president and chief of K Mart's apparel division. He joined the company at the age of 22 and moved up to assistant manager of S. S. Kresge stores in New York, Pennsylvania and Connecticut.

As president and chief operating officer he will be responsible for all operating divisions of K Mart. Reporting to him will be Mr Larry

Emmerson to lead RCA Red Seal

By Paul Taylor in New York

MR MICHAEL EMMERSON, the president of London Artists, an international artists' management company based in London, has been appointed president of RCA Red Seal, which carries the RCA group's classical music label. Mr Emmerson, who will be based at RCA/Ariola's New York headquarters, will report to Mr Elliot Goldstein, president and chief executive of RCA/Ariola. Before running London Artists, Mr Emmerson worked in concert promotion presenting such artists in Britain as Andrzej Segovia, Arthur Schnabel, Sarah Vaughan and Pete Seeger.

He also has extensive experience of the professional theatre. This includes stage direction and management of the Royal Shakespeare touring company. He founded and directed the Newcastle upon Tyne festival and for eight years ran the Belfast Festival in Northern Ireland.

Mr Goldman, announcing the appointment, said: "Michael's extensive experience with and knowledge of classical music and his very special worldwide market made him a natural candidate for the important position of president of Red Seal."

Edmund de Rothschild in tar sands project

BY ROBERT GIBBENS IN MONTREAL

M. EDMUND DE ROTHSCHILD, a former chairman of investment bankers N. M. Rothschild of the UK, is becoming involved in a major tar sands mining and extraction project in Alberta. Mr Rothschild has helped to promote and finance a number of large energy projects in Canada, most conspicuously the Churchill Falls hydroelectric project in Labrador, completed in the early 1970s and now regarded as one of the greatest energy bargains ever.

Churchill Falls at Churchill Falls, about 1,000 miles north-east of Montreal, was diverted to drive turbines with a capacity of 5,000 Mw. The project was completed on time, on budget, before the 1973 energy crisis, and the power is now sold to Quebec.

Mr de Rothschild has been appointed a director of Solv-Ex Corporation of Albuquerque, New Mexico, which with Shell

Ludwig to manage Dutch dredger

By Our Financial Staff

MR J. W. LUDWIG is to be appointed general manager of Amsterdam Dredging, a Dutch company which is to build a hopper dredger for the Dutch Government. Mr Ludwig will be in charge of reorganisation plans for the dredging division. These contain as first phase a major reduction in staff and elimination from the fleet of older vessels for which no profitable employment can be found.

Work on existing orders is, the group says, to continue as normal. There is to be, it adds, an active acquisition effort for orders such as the hopper dredger "Lelystad" which vessel is to be commissioned soon.

Mr Ludwig's commission includes investigating the possibility of setting up a dredging division as an independent unit.

California bound

THE ROYAL BANK OF Scotland has appointed Mr James M. Stott, deputy manager of its San Francisco agency and representative office.

He is succeeded as vice-president of the bank's New York branch and representative office by Mr Alexander D. Wilson.

Canada's science minister to have Howe as aide

BY ROBERT GIBBENS

MR BRUCE HOWE, one of western Canada's best-known businessmen, moves to Ottawa at the end of November to become secretary to the Minister of Science and Technology, a job that is equivalent to that of deputy minister. Mr Howe, born in Sydney, Ontario, and a chemical engineer by training, joined British Columbia Resources Investment Corporation (BRIC) in 1980 as president and chief executive of the company.

Blended, the forest products concern. Later, he became chairman and chief executive of Mr L. Jack Smith president. Mr Smith moved to BRIC from Westcoast Transmission five years ago.

Mr Howe remains as chairman of BRIC until November, while Mr Smith also assumes the title of chief executive.

BRIC is a leading holding company started a decade ago by the British Columbia Government.

COMMERZBANK OVERSEAS FINANCE N.V. U.S. \$100,000,000 Floating Rate Notes Due 1989. In accordance with the provisions of the Notes notice is hereby given that for the three months period from August 21, 1986 to November 21, 1986 the Notes will carry an interest rate of 6 1/4% per annum with a coupon amount of U.S.\$ 158.13. Frankfurt/Main, August 1986. COMMERZBANK AGIENBERGSTRASSE

Table with columns for bond numbers (13-585) and values. Includes section 'NORSK HYDRO A/S 12% EURO-NOK LOAN OF 1983/1991' and 'COMMERZBANK OVERSEAS FINANCE N.V. U.S. \$100,000,000 Floating Rate Notes Due 1989'.

Journalist

WORLD STOCK MARKETS

Table of world stock markets including Austria, Germany, Norway, Australia, Japan, Canada, and others. Columns include country, date, price, and change.

CANADA

Table of Canadian stock markets including Toronto and Montreal. Columns include stock name, price, and change.

INDICES

Table of various stock indices including New York Dow Jones, NYSE Composite, and others. Columns include index name, value, and change.

OVER-THE-COUNTER

Table of over-the-counter market closing prices for various stocks. Columns include stock name, price, and change.

NEW YORK DOW JONES

Table of New York Dow Jones index performance over time. Columns include date, index value, and change.

NYSE CONSOLIDATED 1500 ACTIVES

Table of NYSE Consolidated 1500 Actives index performance. Columns include date, index value, and change.

NYSE COMPOSITE CLOSING PRICES

Table of NYSE Composite Closing Prices for various stocks. Columns include stock name, price, and change.

BENEFICIAL ACTS TO THWART UNFRIENDLY TAKEOVER

Article discussing Beneficial Corporation's insurance-based strategy to protect against unfriendly takeovers.

AMSTERDAM/DELFT/EINDHOVEN GRONINGEN/DE HAGUE/HAARLEM/HEEMSTEDER/LEIDEN/LEIDERDORP/OEGSTGEEST/RISWIJK/ROTTERDAM/UTRECHT/WASSENAAR

HAND DELIVERY SERVICE

ANTWERP/BRUSSELS/GENT/KORTRIJK LEUVEN/LIEGE/LUXEMBOURG

NEW YORK STOCK EXCHANGE COMPOSITE CLOSING PRICES

Main table containing stock prices, organized into columns for various sectors and individual stocks. Includes sub-sections for 'D O D', 'K K K', and 'L L L'.

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NYSE COMPOSITE CLOSING PRICES

AMEX COMPOSITE CLOSING PRICES

Table of NYSE Composite Closing Prices. Columns include 12 Month High, Low, Stock, Div, Yld, P/E, High, Low, Change, and Open. Includes sub-sections for OTC and W W W.

Table of AMEX Composite Closing Prices. Columns include Stock, Div, Yld, P/E, High, Low, Change, and Open. Includes sub-sections for OTC and W W W.

OVER-THE-COUNTER Nasdaq national market, closing prices

Table of Over-the-Counter (Nasdaq) Closing Prices. Columns include Stock, Div, Yld, P/E, High, Low, Change, and Open. Includes sub-sections for OTC and W W W.

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Continued on Page 27

FINANCIAL TIMES WORLD STOCK MARKETS

WALL STREET Caution over Fed efforts on economy

US FINANCIAL markets traded cautiously yesterday as Wall Street assessed the implications of the efforts by the Federal Reserve Board to stimulate a flagging domestic economy...

Stock markets in the UK and Hong Kong were closed yesterday for public holidays.

son Lehman, arguing that the Fed would cut its discount rate again some time this autumn - with or without accompanying action by the other major trading nations.

Bond prices, subdued at first by worries over the possible inflationary effects of the Fed's actions, rose sharply towards the close to show gains of 1/4 point.

Weakness in General Motors, down 5% at \$72 1/4, Merck, \$2 off at \$111 1/4, Du Pont, 1 1/2% off at \$80 1/4, and Procter & Gamble 1 1/4% off at \$77 1/4, depressed the major indices.

But a Merrill Lynch recommendation for IBM took the stock up 1 1/4% to \$139 3/4 in brisk trading, and some other technology issues also brightened.

Digital Equipment gained 1 1/4% to \$101, and Burroughs at \$73 1/4 added 3/4% as the Burroughs/Sperry merger came on stream. But Honeywell, still unsettled by the disclosure that Sperry considered making a bid, eased 5/8% to \$71.

Wall Street's unhappiness with General Motors was fuelled by the car group's offer of retirement incentives for white-collar workers - it wants to slash this workforce sector by 25 per cent by 1989. But other Detroit car shares also ran into profit-takers. Ford, the most fa-

voured motor stock in recent weeks, was 3 1/4% down at \$61 1/4, and Chrysler lost 3 3/4% to \$40 1/4.

Major airline stocks rose smartly on the news that People Express, the fare cutter, may put its Frontier Airlines unit into bankruptcy law protection, as United's plan to buy Frontier crumbles in the face of negotiations with the pilots' union.

At 4 1/4% People Express was unchanged, but Wall Street's view of the case was revealed in a jump of \$2 to \$55 in United shares.

Other domestic airline issues firmed at this sign of distress among the fare-cutting rivals, but Pan Am remained flat at 5 3/4%.

But once again, the market was featured by a number of takeover and special situation stocks.

There was another session of heavy turnover in USX, the former United Steel, the shares dipping 3 1/4% to \$19 as the market awaited further comments from Mr Robert Holmes a Court, the Australian entrepreneur who is taking a stake in the steel company.

The most active NYSE stock was ICN Pharmaceuticals, down 5 3/4% at \$21 1/4 after adverse comments on the stock and its Virazole drug in the investment press. Two quoted subsidiaries of ICN also ran into sellers, Viratek tumbling 5 1/8 to \$51 and SPI Pharmaceuticals 5 3/4% to \$26 1/4.

Also weak was Beneficial Corp, 5% off at \$72 1/4 in heavy trade after the board's decision to sell the company was believed to have attracted active interest from a host of major names, ranging from Ford, GM and Chrysler to Manufacturers Hanover and some foreign banks.

Despite expectations that prime rate would have to be lowered soon, bank stocks remained steady. J. P. Morgan shed 5/8% to \$92 1/4, but Chase Manhattan at \$42 1/2 edged up 5/8%.

In the credit markets, federal funds climbed to 5% per cent bringing \$1.5bn in customer repurchases by the Fed. Treasury bill rates shaded by two basis points.

CANADA

WEAKER OILS offset most of the early gains in active Toronto trading. Total Petroleum North America traded 1/4% lower at C\$25 1/4, Shell Canada dipped C\$ 3/4 to C\$21 1/4 and Dome Petroleum gave up 5 cents to C\$1.25.

Alcan managed a C\$ 1/4 rise to C\$41 1/4 as it detailed the Norsk Hydro plan to purchase five European aluminium extrusion plants from the group. Industrials in Montreal showed the largest declines.

EUROPE Banks lead way to fresh peaks

ANOTHER PAIR of records was managed on the European bourses yesterday despite the slower pace of trading induced by the holiday season. European bank shares, however, staged a broad advance on the hope of lower interest rates.

Brussels edged higher to a new peak in thin trading that reflected the absence of many British investors. The Belgian Stock Exchange index added 0.32 to 3,868.08. Banks and retailers were the firmest sectors as holding companies and industrials tended mixed.

Merger rumours continued to trigger demand for UCB, up BFr 20 to BFr 9,030, while Solvay, linked with the UCB speculation in the past, fell BFr 50 to BFr 7,430.

Market bellwether Petrofina slipped BFr 70 to BFr 8,990 on news that its American subsidiary planned a major capital increase through a one-for-10 share offering within the next month. Reserve gave up BFr 40 to BFr 3,090, and FN, the sports goods to arms maker, dipped BFr 30 to BFr 2,080.

Madrid demonstrated a more dynamic run-up to a new peak as the Bourse index rose 2.55 to a record 198.47, mainly on the strength of the banks and telecommunications sectors.

Particularly active trading boosted Banco Popular 65 percentage points to 1,425 per cent of nominal value, and Vizcaya jumped 40 points to 1,600 per cent. Ten-point gains were registered by both Banco Hispano at 435 per cent and Banco Santander at 780 per cent.

Telefonica led the communications sector higher with its 1 1/2 point advance to 197.25 per cent. Petroleos was one of the few shares to move against the trend as it shed 2 points to 347.50 per cent.

Frankfurt was dominated by domestic buyers as overseas support evaporated. Speculation persists that the Bundesbank will cut its rates soon, and bank stocks were quick to respond with large gains. The Commerzbank index, heavily weighted with banking constituents, rose 11.2 to 2,102.2.

Commerzbank led the way with a DM 13.50 jump to DM 349.50 ahead of its Tokyo listing presentation, Deutsche Bank

closed DM 4 up at DM 850 and Dresdner at DM 456.50 was DM 2 higher.

Car makers continued to draw support, with BMW up DM 11 at DM 623 while Daimler put on DM 9 to DM 1,315.

The bond market was quiet due to the lack of British support and the easier tone in the US credit markets on Friday. Prices lost up to 10 basis points.

Opinion is still sharply divided over Bundesbank intentions on rates.

Many see Thursday's fortnightly meeting of the central bank's policy-making council as the stage for the next cut in the discount rate, currently 3.5 per cent, and the Lombard rate, now at 5.5 per cent. Other observers see early September as the earliest move.

The Bundesbank yesterday bought DM 32.5m worth of domestic paper.

Paris recorded its 11th consecutive gain on the conviction that interest rates would fall shortly.

L'Oréal picked up FFr 5 to FFr 3,044 as the cosmetics group detailed a FFr

West German companies are expected to float a record volume of new shares this year after new-issue volume in the first half more than doubled last year's comparable figure, according to Deutsche Bank. Domestic groups issued DM 7.1bn of new shares in the first six months compared with a total DM 9.3bn for all of 1985.

A 1.4bn capital increase, 60 per cent of which will be allocated to foreign investors.

Amsterdam moved lower in slow trading, and the ANP-CBS General index lost 2.2 to 293.7. Unilever, still in pursuit of Naarden International, fell Fl 2.50 to Fl 515.50 while Fokker lost Fl 1.60 to Fl 68.50.

Stockholm lost ground. Ericsson, most active, retreated SKr 3 to SKr 231 ahead of results due this week while Electrolux, also active, fell SKr 4 to SKr 305. Atlas Copco shed SKr 10 to SKr 211 on consideration of its slightly firmer half-year statement.

Milan finished mixed, and Zurich was steady.

SOUTH AFRICA

MODERATE local demand prompted another record in Johannesburg although the closure of the UK market for a holiday dampened overall activity.

Steady support for gold and industrial issues was evident, and the All Gold Index jumped 20 points to a record 1,660 while the broader market index peaked with a 12-point gain to 1,838.

Among blue-chip golds Vaal Reefes added R2 to R322, and Buffels at R101 was R1.50 higher.

TOKYO Rate hopes fuel record one-day gain

INSTITUTIONS and individuals were energetic buyers of stock in hectic Tokyo trading which saw the Nikkei market average post its largest-ever single-day upsurge, writes Shigeo Nishioka of Jiji Press.

The index rose 432.78 to 18,565.61, recouping more than half the steep loss seen in the previous three trading days. The sharp advance was attributed to expectations of a cut in interest rates and a resultant rise in stock prices.

Large-capital steels, shipbuilders, heavy electricals and power companies drew particularly heavy buying. Domestic demand-related issues, trading houses and financial stocks also gained on a broad front.

The market average had chalked up a 505-point upsurge at one stage in the afternoon. Volume shrank from 1.9bn shares on Friday to 1.2bn reflecting a hesitant mood at the start of the session. Gainers outpaced losers 598 to 206, with 117 issues unchanged.

The rapid rise in stock prices and a sharp rally in crude oil prices made investors wary last week, leaving the Nikkei average down 803 points in the three days from Thursday. But yesterday many institutional investors saw a good opportunity to buy, and individual investors followed their lead.

Leading brokerage houses said there was no factor supporting such a sharp rebound and that the active purchases mirrored the massive surplus funds of institutional investors.

Large-capital stocks were at the centre of attention, with institutional investors stepping up their purchases. Trading in the 10 most active issues accounted for as much as 61.7 per cent of the total volume.

Nippon Steel, at the top of the active list on 175.24m shares traded, added Y20 to Y257, a record high. Kawasaki Steel came second with 173.74m and rose Y24 to Y284 while Nippon Kokan and Mitsubishi Heavy Industries climbed Y24 to Y301 and Y32 to Y277, respectively.

Among heavy electricals, Toshiba put on Y21 to Y695, Hitachi and Mitsubishi Electric were each Y10 up at Y1,040 and Y505, respectively. Utilities advanced, with Tokyo Elec-

tric Power rising Y340 to Y7,060 and Tokyo Gas Y35 to Y885. Trading houses scored conspicuous gains. Mitsubishi jumped Y80 to Y1,200, Daiwa Y45 to Y783 and C. Itoh Y50 to Y699. Nissho Iwai closed Y70 higher at Y574. Observers noted that these issues were cheaper than large-capital stocks.

Financial stocks and blue chips were higher. Tokai Marine and Fire finished Y120 up at Y1,770. Sumitomo Bank Y160 up at Y2,390 and Nomura Securities up at Y20 higher at Y3,320. NEC advanced Y80 to Y1,620, JVC Y60 to Y2,440 and Canon Y40 to Y990.

Kajima moved up Y30 to Y1,160 and Taisei Y30 to Y710 while Mitsubishi Estate added Y80 to Y2,350.

In the bond market, dealers remained on the sidelines, and prices dipped. Although institutional investors and dealers are bullish about the future price trend, sharing the view that Japan and West Germany will carry out concerted interest-rate reductions in September, they apparently decided not to buy actively in view of the fast rise since the beginning of the month.

The yield on the benchmark 6.2 per cent government bond maturing in July 1995 rose from 4.565 per cent on Saturday to 4.575 per cent.

AUSTRALIA

RIISING DOMESTIC interest rates and a softer gold price subdued Sydney trading and trimmed 4.2 off the All Ordinaries index to 1,179.1. Turnover slipped to 64m shares compared with Friday's 80.4m.

BHP staged a late rally to finish the day 4 cents cheaper at A\$7.80, after trading at A\$7.84, and Bell Resources retreated 8 cents to A\$5.04 after an early A\$5.

Banks were under pressure, with ANZ off 7 cents to A\$4.78, National 2 cents to A\$5.34 and Westpac 1 cent to A\$4.65.

Among stronger oils Santos gained 7 cents to A\$3.75. Lex. Page 14

SINGAPORE

A NERVOUS start to Singapore trading was overcome as blue chips rallied in response to the news that Malaysian businessman Tan Koon Swan had pleaded guilty to charges of abetting in a criminal breach of trust relating to the collapse of Pan-Electric Industries.

Long-neglected Malaysian issues were also bought as a result, partly reflecting market sentiment that the Pan-Electric affair was almost over. The Straits Times industrial index added 2.45 to 813.79 on lower volume of 22.4m shares.

With glass like this, who needs a St. George?



Schott has developed a special type of glass that can stand up to fire for as long as two hours. Even longer sometimes. And it's only 6.5 mm thick. It's called Pyran and it's the ideal fire-resistant glass for doors, windows and partitions.

Fire is a monster. Since time began, men have looked for ways to protect themselves against it. Ordinary window glass is no use. In a fire it breaks and lets the flames spread without anything to hold them back.

Schott tackled this problem by developing a special fire-resistant glass for use in windows. Basically it's what we call a borosilicate glass. But we also toughen it so that it provides protection against fire for as long as two hours. And it stays clear and transparent all that time. Which is quite important when there's a fire. Especially on escape routes.

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But Pyran is only one example of Schott's developments. There isn't a single area of advanced technology that can't merge with special glass: space and marine exploration, environmental protection, health-care, energy recovery or biotechnology.

Here are the facts about the Schott Group in brief: 50,000 different products, 40 production units worldwide, 300 sales subsidiaries and agents in more than 100 countries, annual turnover more than £500 million.

If you'd like to know more about Pyran fire-resistant glass or any other Schott Group product write to Schott Glass Ltd, Drummond Road, Department FT, Stafford ST16 3EL.

SCHOTT SCHOTT No. 1 in Europe for Special Glass.

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Selfies 10/10

FINANCIAL TIMES SURVEY

Aerospace

The overall long-term outlook for the world's aerospace industries remains bright, despite severe current problems in some areas, such as airline finances, pressures on some defence budgets, and difficulties with the US space programme.

Pace likely to accelerate

THE WORLD'S aerospace industries gather for the biennial Farnborough Air Show, starting next Sunday, in the knowledge that for the rest of this century the pace of their activities is likely to accelerate rather than slacken.

While several major billion-dollar civil and military aircraft, engine, guided weapons and space programmes are already under way, and will come to fruition in the years ahead, many other new ones are in the conceptual or early planning stages.

As these mature, they will provide massive additional workloads, while also driving the frontiers of technology further forward.

In the UK alone, several major decisions are pending. For civil aircraft these include participation in the new European Airbus A-350 high-density short-to-medium range and A-340 four-engine long-range transport programmes.

In military aviation, full-scale development of the four-nation Eurofighter will be sought around the middle of next year, while before then a decision will have to be taken on the future of the Nimrod airborne early warning aircraft programme.

In helicopters, future participation in the joint Anglo-Italian A-128 light attack helicopter and the possibility of the multinational European NH-90 helicopter for the 1990s will have to be settled. And in space, decisions on involvement in such ventures as the projected Horizontal Take-Off

and Landing (Hotol) "trans-atmospheric vehicle" will have to be taken.

UK Government financial involvement in all these ventures will be such that the scope and style of the Government's management of its investments will also need to be reconsidered. The Commons Defence Committee has already urged that a Ministerial Aerospace Board should be considered as a means of co-ordinating government involvement in aerospace

By Michael Donne, Aerospace Correspondent

and of avoiding future political imbroglios such as that surrounding last winter's Westland affair.

Such a board would have broad aerospace industry approval, for the kind of disarray experienced last winter does no section of the industry any good since it lowers confidence in the Government's ability to handle the industry's complex affairs expeditiously and efficiently.

All the ventures outlined will be critical to the full exploitation of the UK's industry's own skills and resources through to the end of this century, if it is to win its share of growing world markets for aerospace products of all kinds.

It has been estimated that total Western world markets for aerospace and related equipment — civil and military aircraft, engines, guided weapons, spacecraft and avionics — will amount collectively to some \$1,500bn by the end

of this century.

Although some arenas, such as civil aviation, are more sensitive to economic cycles than others, overall the trend in aerospace and related spending is likely to be upwards, the rates varying according to region and short-term developments — although the latter may be of less significance than they may immediately appear.

The difficulties encountered by some airlines on the North Atlantic routes this summer.

This is just as much the case in Western Europe as in the US, where the finances of many airlines are still weak, which accounts in turn for much of the hostility that pressures for deregulation arouse. That deregulation is inevitable is becoming more widely accepted, although there is still a considerable way to go. There are still some considerable differences of view over the pace at which it should be implemented.

Nevertheless, in commercial aviation, all the major manufacturers agree that between now and the end of the century there will be a massive market for jet airliners amounting to more than \$250bn, and accounting for upwards of 5,500 new aircraft of all kinds.

These will be needed both to replace existing ageing fleets and to meet traffic growth. In addition, there will be a major demand for smaller aircraft to meet the growing needs of the commuter and regional aviation sectors.

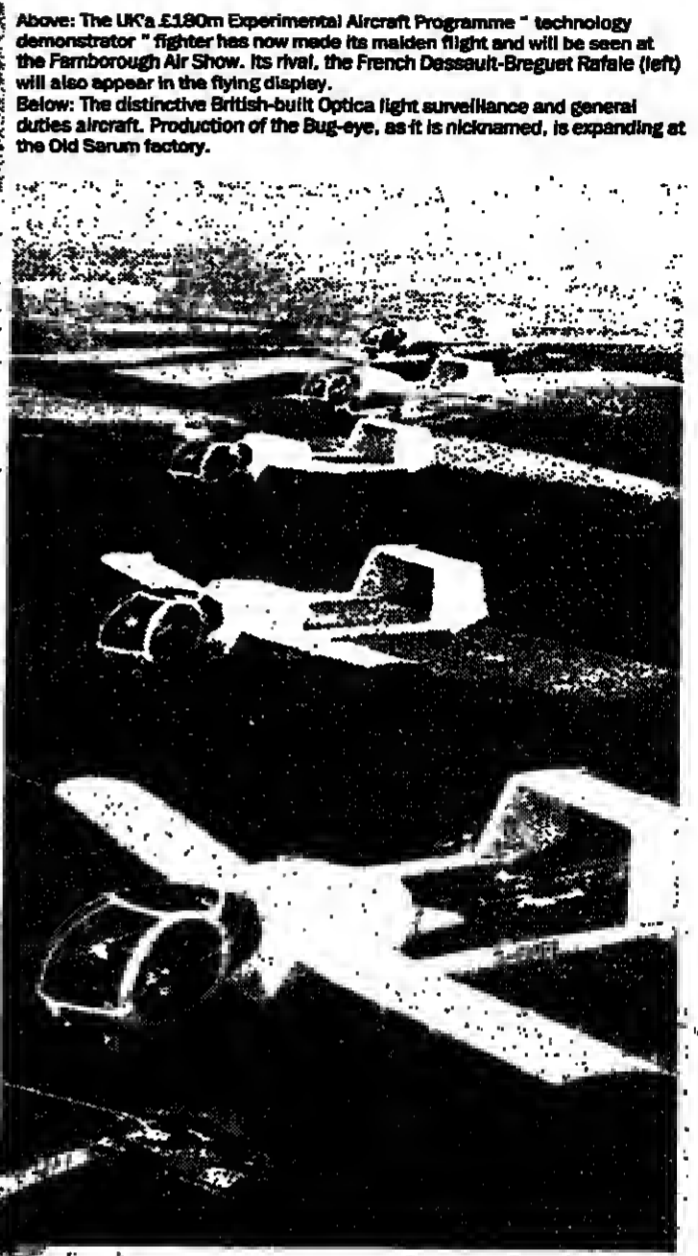
General aviation, which includes the business aircraft sector as well as the provision of light aircraft for other purposes including leisure flying, has been slower to expand in recent years.

Manufacturers, especially in the US, have been seriously affected by such problems as the increasing costs of product liability insurance, stemming from rapidly escalating court awards in liability litigation.

This has so inflated the prices

of this century.

Continued on page 2



Above: The UK's £150m Experimental Aircraft Programme "technology demonstrator" fighter has now made its maiden flight and will be seen at the Farnborough Air Show. Its rival, the French Dassault-Breguet Rafale (left) will also appear in the flying display.
Below: The distinctive British-built Optica light surveillance and general duties aircraft. Production of the Bug-eye, as it is nicknamed, is expanding at the Old Sarum factory.

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WESTLAND

Famous for its European Lynx. (And its European links.)

FRANCE—40 ANGLIO-FRENCH LYNX DELIVERED TO THE AERONAUTIQUE NAVALE

BRITAIN—26 ANGLIO-FRENCH LYNX ORDERED FOR THE BRITISH ARMY

WEST GERMANY—19 ANGLIO-FRENCH LYNX ORDERED FOR THE BUNDESMARINE

EH 101—A NEW NAVAL HELICOPTER BEING DEVELOPED JOINTLY BY WESTLAND AND AGUSTA OF ITALY

GAZELLE—FRANCO-BRITISH COMMUNICATIONS HELICOPTER IN WORLDWIDE CIVIL AND MILITARY SERVICE

NETHERLANDS—24 ANGLIO-FRENCH LYNX DELIVERED TO THE KONINKLIJKE MARINE

Lynx is the name of one of the world's most successful helicopters. It's also the result of just one of Westland's highly successful international collaborative ventures.

Over the last nineteen years, Westland have worked with Aerospatiale of France to produce not only the Lynx, but also the Puma and the Gazelle. And that's just one of our international links.

We've been in partnership with Sikorsky, to take another example, since the Second World War. Out of that pool of expertise and experience have emerged such well-known names as Dragonfly, Wessex, Whirlwind and Sea King. And now we're working together more closely than ever to produce the new Black Hawk helicopter.

Agusta of Italy are another company with which Westland have longstanding and strong ties. Now Westland and Agusta have joined forces to design and build NATO's major naval helicopter for the 1990s, the EH101.

Westland is working with companies in five European countries on two new helicopter projects, the NH90 and the Light Attack Helicopter. We're involved in advanced airborne technology and hovercraft. And we're constantly working on new projects for the future.

We call it team technology. And it works.

WESTLAND TEAM TECHNOLOGY

Aerospace 2

Pace is likely to accelerate

CONTINUED FROM PAGE 1

of small light aircraft as to drive down sales and threaten the viability of some manufacturers. Legislation to regain some control over this situation is now pending, but it remains a problem that every world aerospace manufacturer of civil aircraft views with concern, especially if he is exporting to the US, as most are.

In military aviation, pressures on some defence budgets, including the UK, have either resulted in, or threaten, some near-term reductions in military aerospace spending, and the possibility of some further constraints, such as more stringent siting of plans for new projects, may emerge.

However, in the long-term, overall spending on defence in the non-Communist world seems likely to grow between now and the end of this century.

Spending on military aircraft alone is estimated to amount to more than \$500bn over the next 14 years, with especially large markets emerging for tactical combat aircraft.

New programmes already being initiated in Europe include the Eurofighter between the UK, West Germany, Italy and Spain, and the French Rafale with possible collaboration from the Netherlands and Belgium and Norway. In the US there are plans for new Advanced Tactical fighters for both the US Air Force and Navy, and an Advanced Technology Bomber (ATB) for the USAF.

Another major expanding aerospace market is avionics, now a multi-billion dollar business worldwide. About one-third of the value of all civil and military aircraft, engines, guided weapons and space is accounted for by equipment of all kinds, of which in turn avionics—airborne electronics—ranging from radars through to navigation and flight control systems and guidance systems—accounts for a substantial proportion.

In turn, the increasingly stringent performance demands of modern aerospace vehicles are placing ever more severe pressures on the avionics industry. Avionics is already the spearhead for the entire electronics industry, and the technological advances now taking place will be just as far-reaching in their impact on other industries as those other developments occurring in such

arenas as materials technology and manufacturing techniques.

In space, the tragic disaster to the Challenger Space Shuttle last January has substantially delayed further US manned space flights for commercial and military purposes, and as a result also the eventual development of the next big US manned space venture, the Space Station.

With the expenditure of money, energy and time, the US space programme will eventually get back on track. The US Government decision to build a fourth "Orbiter" Shuttle spacecraft is bound to help in this direction. Space activities are vital for the long-term development of technology across a wide spectrum of aerospace and related activities, and the West as a whole would be damaged by lengthy delays in US space ventures.

In Western Europe, despite some problems with the Ariane launch vehicle, the space industry has matured rapidly, and Ariane itself is being called on to play a bigger role in satellite launching pending the return of the Space Shuttle.

At the same time, there are ambitious further development plans for Ariane, to enable it to launch bigger payloads and eventually Europe's own manned space transport vehicles such as Hermes.

While inevitably there will be some rivalry with the US in effect those involved in the Western space programmes will also continue to work closely together—especially, for example, on Space Station, for Europe could never afford such expensive ventures on its own.

In all these arenas, the advanced technological nature of the new ventures envisaged is in turn forcing many advances in industrial and scientific disciplines, ranging from new materials such as carbon fibres, through to new methods of manufacturing and handling such as super-plastic forming, diffusion bonding and robotics.

And new ways of flying, such as "fly-by-wire" using electronics to control aircraft manoeuvres, with "fly-by-light" the use of fibre optics are on the way.

Outside the major aerospace nations—the US, the Soviet Union, the UK, Western Europe and Japan—aerospace is being increasingly recognised as the fastest method of advancing a

nation's technological capabilities, and more and more countries are promoting the development of aerospace industries, especially in the Third World, and especially in South East Asia.

One of the most significant developments over recent years, and one of which many of these smaller countries are now taking advantage has been the growth of international collaboration on a wide variety of aerospace ventures, despite the continuation of fierce competition.

This covers the entire aerospace spectrum. In commercial aircraft, Airbus Industrie in Western Europe is the prime example. In aero-engines, the five-nation consortium, International Aero-Engines, building the Y250 engine for the European A-320 Airbus, is strong evidence of the trend.

In military aviation, the forthcoming Eurofighter and the current Tornado combat aircraft also illustrate the trend, while the European Space Agency, the Franco-German Euromissile group, and the Anglo-Italian EH-101 helicopter venture are all excellent examples of what international collaboration in aerospace can achieve.

As the costs of individual aerospace projects continue to soar into the multi-billion dollar bracket, collaboration as a means of widening markets and sharing the costs increasingly will dominate the world aerospace industry.

There have even been suggestions for a multi-national project for profitability this year have dropped sharply in the past three months for many carriers. There are exceptions, of course, but in general, the trend is down, though fluid.

"We estimate that, at best, the industry could show a break-even result this year or possibly a marginal profit. At worst, the losses could amount to \$1bn or more."

This contrasts with a system-wide profit by IATA's 144 airlines last year of \$800m after tax, and profit of \$600m on international scheduled services alone.

Mr Eser went on to point out that the possibility of profits depended on what savings on fuel costs actually occurred, and on how traffic growth recovered as the summer progressed.

"On the fuel side, while prices have come down substantially in certain highly competitive supply locations like London, New York and Paris, on the whole the scale of reduction has been far short of the drop in crude oil prices.

"For example, in the 12 months to the end of May, crude oil prices fell by about 55 per cent. Jet fuel prices, however, as reported by members to us, showed an average reduction of

only some 20 per cent for the same 12 month period.

"We expect there are still some further savings to come in certain markets which usually react slowly in passing on such reductions, such as Japan."

On the capacity side, airlines have continued to put more seats into many routes, despite the sharp slackening in traffic growth. Mr Mike Brown, assistant director of management information at IATA, has said that "the gap between capacity and demand is continuing to grow at a high rate, particularly on the Atlantic, where capacity from North American carriers alone has grown by 20.8 per cent."

The danger facing the airlines is that the windfall of cheaper fuel prices, where they have occurred, could be wiped out by falls in revenue yields stemming from over-capacity.

"If yield dips by one per centage point (industry-wide) profit levels will drop by \$400m," Mr Brown says. Looking further ahead, 1987 could be a little better, but not much.

In Mr Brown's view: "Most carriers will break even, but they will be the lucky ones."

The North Atlantic situation continues to trouble many European airlines, especially those in the UK for they depend on that route substantially for much of their revenues. British Airways earns about a quarter of its revenues from North Atlantic operations, British Caledonian over 30 per cent and Virgin Atlantic close to 100 per cent.

In the early summer, the

Airlines

Bleak outlook as traffic growth slows

World total international and domestic revenue traffic (Scheduled services of airlines of ICAO Contracting States)

Year	Passenger-km		Freight tonne-km		Mail tonne-km		Total tonne-km	
	Actual	% Change	Actual	% Change	Actual	% Change	Actual	% Change
1976	576	7.9	764,000	9.5	9.3	7.5	21,540	11.2
1977	610	5.9	815,000	7.2	10.0	7.5	23,390	8.7
1978	679	11.2	996,000	14.4	10.5	5.7	25,940	8.5
1979	735	11.1	1,069,000	13.2	11.0	2.5	28,810	2.0
1980	743	-0.3	1,059,000	-0.9	11.1	0.8	29,590	4.9
1981	752	0.5	1,119,000	2.7	10.9	-1.6	30,590	5.1
1982	764	1.6	1,142,000	2.0	11.6	6.0	31,540	2.1
1983	795	4.0	1,187,000	3.9	12.1	5.4	34,980	10.8
1984	841	5.8	1,271,000	7.1	13.2	9.0	39,490	12.9
1985	891	6.0	1,360,000	7.0	13.2	-0.7	39,510	-0.4

Source: ICAO.

fears of terrorism following the US bombing of Libya, fears of radiation in Europe following the Chernobyl leak, a decline in the value of the dollar, but also a major campaign by the US domestic travel trade for "stay in America" holidays, all combined to depress US-originating Atlantic traffic.

Efforts by the UK and European governments, airlines and travel trade have been only partially successful. While by mid-July there were reports of an upturn in bookings on the North Atlantic, they could not compensate for the damage already done to airlines' balance sheets in the early summer months, and at best airlines will show reduced profits for the summer if not actual losses.

The impact could be serious for some airlines, which depend on summer profits to see them through the bleaker winter months and to produce overall profits for the financial year.

For example, without this summer income, British Airways, in its run-up to privatisation, could be in some difficulty. Its 1985-86 balance sheet showed that in the second six months to end-March, it only broke even, so that its overall profit for the year was due entirely to the profit it earned in the summer of 1985.

However, in recent weeks BA has shown more optimism, with Mr Colin Marshall, chief executive, reporting that "there have been a number of indications from around the world that the worst may be over, and that our business is returning to normal."

Although in the short-term

the situation is exceptionally bleak, for the longer term the overall outlook for the world airline industry is brighter. Forecasts indicate that traffic growth is likely to continue, albeit at a slower pace than the 5 per cent annually of the immediate past, and it still seems likely that short of any unforeseen economic or other disaster, the level of some 891m passengers carried worldwide (including the Soviet Union and China) during 1985 will double by the end of the century, if not before.

It is this longer-term traffic expansion that the world's aircraft manufacturers have in mind when they make their assessments of fleet expansion, amounting to outlays upwards of \$250bn on new jets by the end of the century, for upwards of 6,500 aircraft, both to meet fleet replacements as well as traffic growth.

Paying for all this equipment, however, could be one of the biggest headaches for airline managements for many years.

The IATA view is that the airline industry's profits just will not permit re-equipment on the scale that the manufacturers themselves seem to think will occur, and that the airlines themselves recognise must occur as more and more existing aircraft become both inefficient and too expensive to maintain through sheer age.

The alternative to direct procurement seems likely to be leasing in one form or another, which could provide a cheaper option than making direct loans through banks and other financing institutions. The merits of direct procurement,

with associated heavy interest charges, versus leasing are already being debated long and hard in many airline boardrooms, and it is certain that more and more airlines will opt for the latter method of financing their fleets in the years immediately ahead.

The growth of leasing to meet the airlines' own expanding fleet requirements for jets that in themselves become ever more costly (one new Boeing 747 jumbo jet now cost well over \$100m) is one of the major recent developments in the aerospace industry.

In some cases, these leasing organisations have grown so large and powerful that they can place some of the biggest orders ever seen for new aircraft—out examples being the recent \$2.75bn order by the GPA Group of Shanghai for 100 jet airliners from Boeing and McDonnell Douglas.

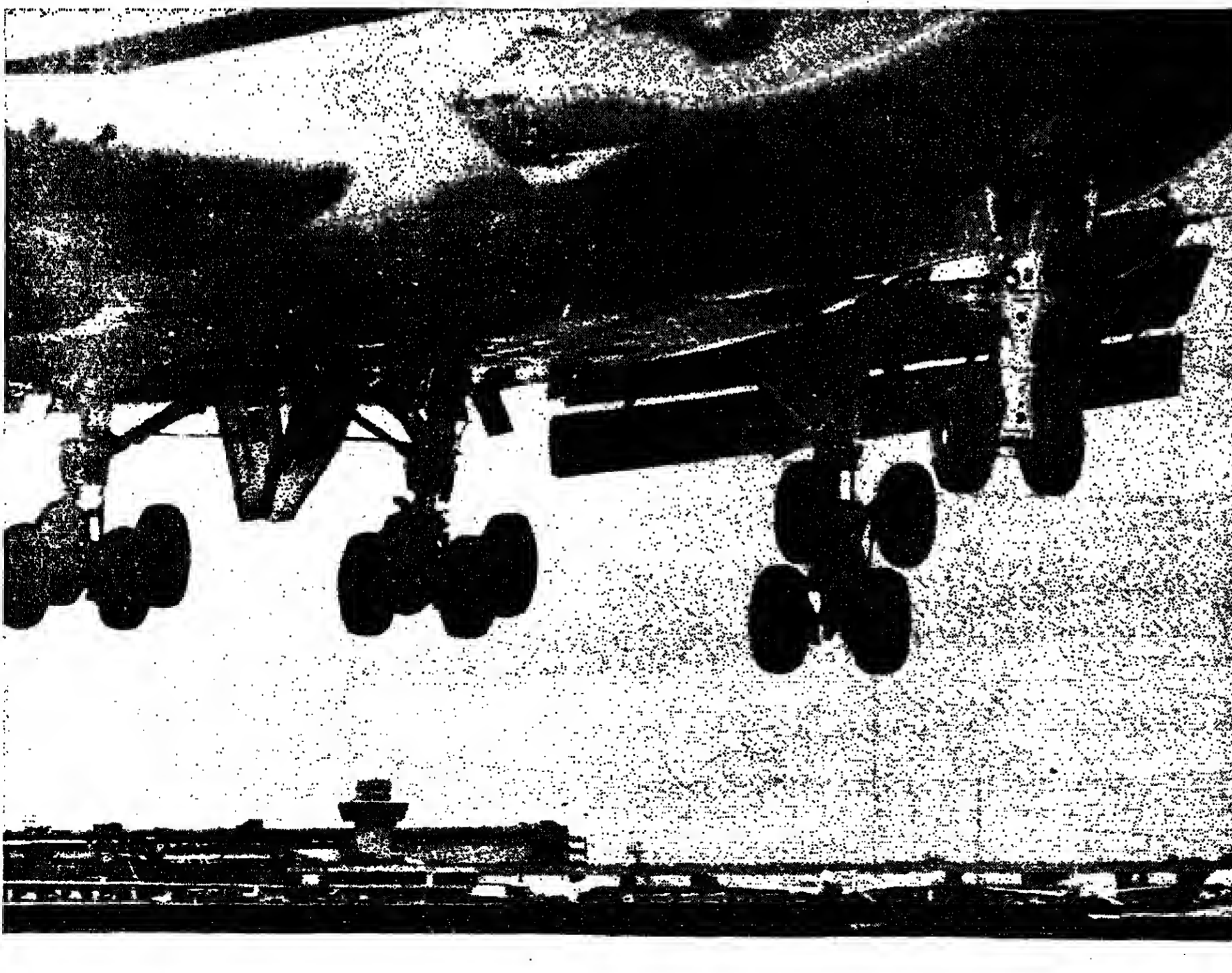
It seems likely through the years ahead that fewer and fewer airlines will resort to buying aircraft, with the attendant heavy burdens of interest on loans from banks and other financing institutions, and will turn more to leasing. Debt repayments by the airlines have been increasing, from around \$1bn in 1980, to reach \$1.7bn in 1984 and \$1.6bn in 1985, with a comparable figure likely for the current year.

It has been estimated by the IATA that depending on the rate at which traffic grows, the IATA member airlines alone will need to invest between \$150bn and \$200bn in new equipment over the next decade, which in turn indicates that they will need to earn average operating profits before interest of at least 7.5 per cent which, allowing for tax, rises to 10.5 per cent.

The airlines are currently not earning that level of profit. In fact, as IATA says, their return on investment and turnover is totally inadequate for the massive re-equipment programme before them. Many airlines are already over-borrowed, and will face increasing difficulties in finding additional finance to meet their needs.

Leasing, rather than buying, is now probably the only way out of their problems unless their governments come to their aid with preferential loans.

Michael Dome



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Left: An aircraft track obtained with conventional SSR.

Right: The same track obtained by Cossor Monopulse.

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Airliners

Re-equipment tide flows strongly

THE WORLD'S major airliner manufacturers are having a good year, as airlines progressively phase out existing ageing fleets and acquire replacement aircraft, or re-equip to meet the substantial traffic growth anticipated between now and the end of the century.

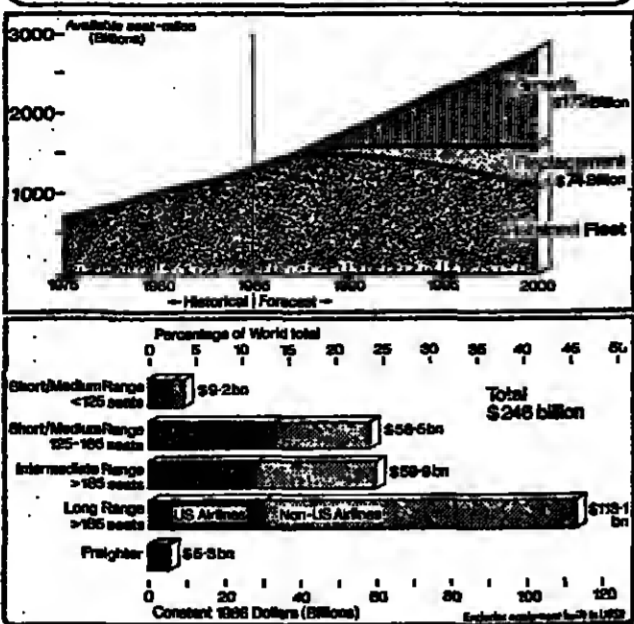
This re-equipment tide is flowing despite some airlines' cash difficulties stemming from currently poor financial results. But the fact that they are still able, and anxious, to acquire new equipment indicates both their own determination not to be left behind by the competition, and the confidence of the leading institutions in the air transport industry's long-term viability.

Boeing, the world's biggest airliner manufacturer, logged new firm orders for 242 aircraft in the first six months of this year, worth \$12.6bn, compared with last year's first six months' total of 77 aircraft, and the full 1985 total of 390, worth \$14.96bn.

Both Airbus and McDonnell Douglas, Boeing's rivals, have also done well, while there has also been a steady inflow for smaller, commuter and regional types of airliners, such as the SAAB 340, now being delivered, and the new Fokker F-100 and F-50, which is under development.

With the second half of the year, customarily a stronger period for new orders than the first half, and with many airlines currently known to be negotiating major new commitments, it seems likely that for

World Market for Jet Airliners (to 2000)



Source: Boeing Commercial Airplane Company

the whole of 1986, the manufacturers cumulatively will match, if not exceed, last year's total of 822 new jet airliners alone firmly ordered, worth about \$25bn—with orders for turbo-propeller commuter and regional airliners additional to these.

All the major manufacturers are confident that air traffic growth will continue, despite current financial problems for

some airlines and some short-term difficulties with traffic on some routes (such as this past summer's shortfall on the North Atlantic as a result of US visitors staying away from Western Europe).

This growth, the makers believe, together with the increasing need to replace existing ageing jet fleets, will result in substantial increases in orders for new aircraft.

Boeing, for example, believes that between now and the year 2000, the airlines will spend up to \$245bn on new jets, of which \$172bn will be for traffic growth, and \$74bn for replacements.

Boeing bases these estimates on a world average annual passenger traffic growth rate of about 5.5 per cent over that period. It puts the number of aircraft involved at about 5,655 jets, which after allowing for retirements of 2,920 means a net gain of 2,740 jets from the end-1985 fleet total of 6,890 to a total of 9,430.

McDonnell Douglas suggests that up to the end of the century, a total of about 5,435 new jet airliners will be needed, worth about \$250bn, and it also believes that passenger traffic will grow by an average of about 6.3 per cent a year.

Airbus Industrie, whose forecasts run to the year 2005, suggests a more optimistic total of close to 9,000 new jet airliners, which, after discounting existing orders and fleet retirements means a total jet fleet by that time of some 7,850 aircraft. It also bases its forecasts on a broad average annual passenger traffic growth of about 5.5 per cent a year.

To meet these forecasts, all the "big three" jet airliner builders now have major new programmes under way, to meet different sectors of the market.

At the upper end of the scale, Boeing is now selling to airlines worldwide the latest version of its 747 Jumbo, the



Interior of the Fokker F-100 incorporates the most up-to-date ideas on cabin comfort

very long-range Series 400, although it also continues to offer the stretched upper deck Series 300 and the popular Series 200. Boeing now dominates the long-range airliner market, with nearly 730 747s of all types ordered, and more than 640 delivered.

Competition comes from the Douglas Aircraft Division of McDonnell Douglas, with its tri-jet DC-10, of which over 414 have been built and 429 ordered, but this group is now offering the world's airlines an advanced technology derivative called the MD-11, also a tri-jet. Douglas is now canvassing launch customers, and hopes to be able formally to launch the MD-11 into production around the turn of this year.

Airbus is also now planning to enter the long-range airliner market, but with an aircraft of smaller capacity than either the Boeing 747 or the Douglas MD-11. Airbus believes there are many routes worldwide that need long-distance transport but do not have the traffic densities to justify the use of such big jets as 747s or MD-11s.

Accordingly, it is offering the airlines its new A-340 design, a plan for a 260-310 passenger four-engined Airbus that will be built alongside another new venture, the A-330, a twin-engined, short-to-medium range aircraft, also seating about 260 to 310, according to configurations used.

By using a common fuselage and common wings and systems, Airbus believes that it can keep the overall development costs

of both aircraft down sufficiently to enable it to compete fiercely with Boeing and McDonnell Douglas.

Earlier this summer, at the Hannover air show, there were suggestions that Airbus and Douglas might collaborate in the development of a joint A-340/MD-11 type of aircraft for the long-range routes. But although it was not denied that there had been some discussions, their significance was played down by both sides.

It is possible that such notions may be revived at the forthcoming Farnborough Air Show, and there is little doubt that collaboration of such a nature would benefit both companies.

This would ease their development costs, and widen their ultimate markets, and offer formidable competition to Boeing. The latter has plans of its own for a "long/thin" route aircraft—a new derivative of the 747, called the ADV or Advanced Development Variant, capable of flying up to 7,000 nautical miles with about 300 passengers.

While Airbus and McDonnell Douglas are still prepared to go it alone on their respective ventures, it clearly would make economic sense for them to collaborate and thus avoid splitting the market three ways for these long-range, lower-density aircraft, to the detriment of all. McDonnell Douglas cannot,

under US anti-trust laws, collaborate with Boeing, and there are strong precedents for such international collaboration—Boeing itself has a 25 per cent equity stake from the Japanese aerospace industry in its new 737 prop-fan transport, and actively seeks overseas partners on all its other transport aircraft programmes.

Below the long-range market for both high-density and low-density traffic, the entire market is a ferment of activity. Airbus is pressing ahead vigorously with its A-320 150-seater twin-engined aircraft, which is competing directly with Boeing's own 737-400 and 737-300, and the McDonnell Douglas MD-80 series of twin-jets.

Coming along for the early 1990s is the new Boeing 737 twin-engined 150-seat prop-fan airliner, using the revolutionary new power-plants discussed elsewhere in this survey, and the smaller Douglas MD-91X, also a prop-fan but designed for the smaller but equally large market for aircraft seating 100 to 110 passengers.

Below these, there are ideas for smaller prop-fan airliners from such manufacturers as Messerschmitt-Bölkow-Blohm and Dornier of West Germany, that could revolutionise the large market for commuter and regional transports currently dominated by conventional turbo-propeller airliners.

Just how far this prop-fan revolution will eventually go remains to be seen. But if the claims now being made for it

—such as reductions in fuel consumption of up to 40 per cent compared with current generation turbo-fan engines, lower noise, and less pollution—are proved, it seems clear that the jet engine will have a serious rival through the 1990s and into the next century.

This will not mean the end of the jet engine as we know it, however. The massive investments already made, and likely to be made through the rest of this century in such jet airliners as the Boeing 747, 757, 767 and 777, Douglas MD-11 and MD-80, and the Airbus A-330 and A-340, are not likely to be thrown overboard.

While all the major jet airliner builders will be bound to explore the possibilities of the prop-fans, and at some stage in the future may even offer variants of their existing jet aircraft with prop-fan engines, the jet airliners now under development today will remain in service for as much as 20 years or more.

What cannot be overlooked, however, is that massive investments are also being made in prop-fan developments, and engine builders as well as the airframe manufacturers will be seeking returns on those outlays.

The pressures on airlines to convert to prop-fans will be immense, and the rivalry between the two types of propulsion will be formidable indeed.

Michael Donne



Boeing's latest Jumbo, the very long range 747-400 now ordered by British Airways

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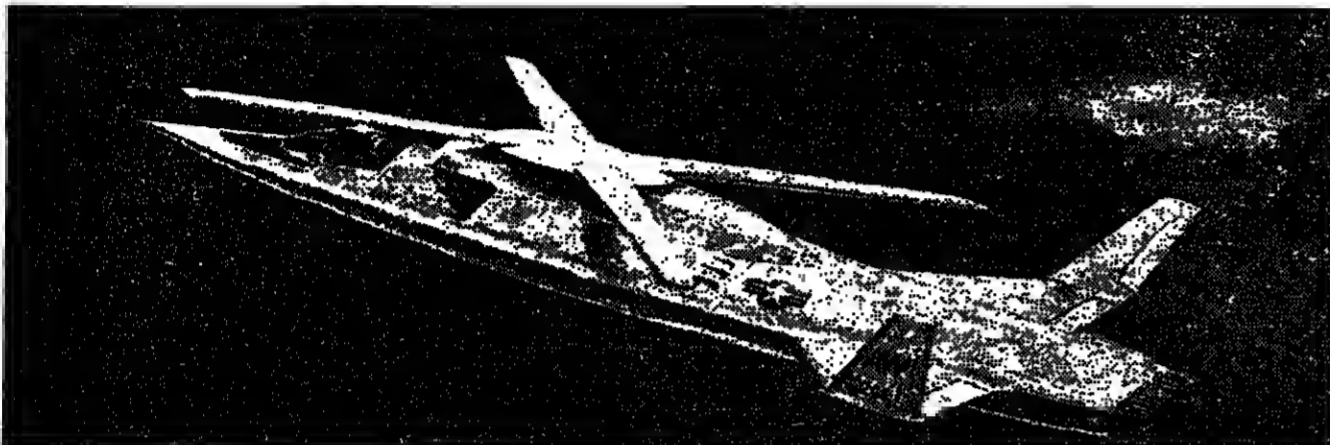
Aerospace 4

Helicopters

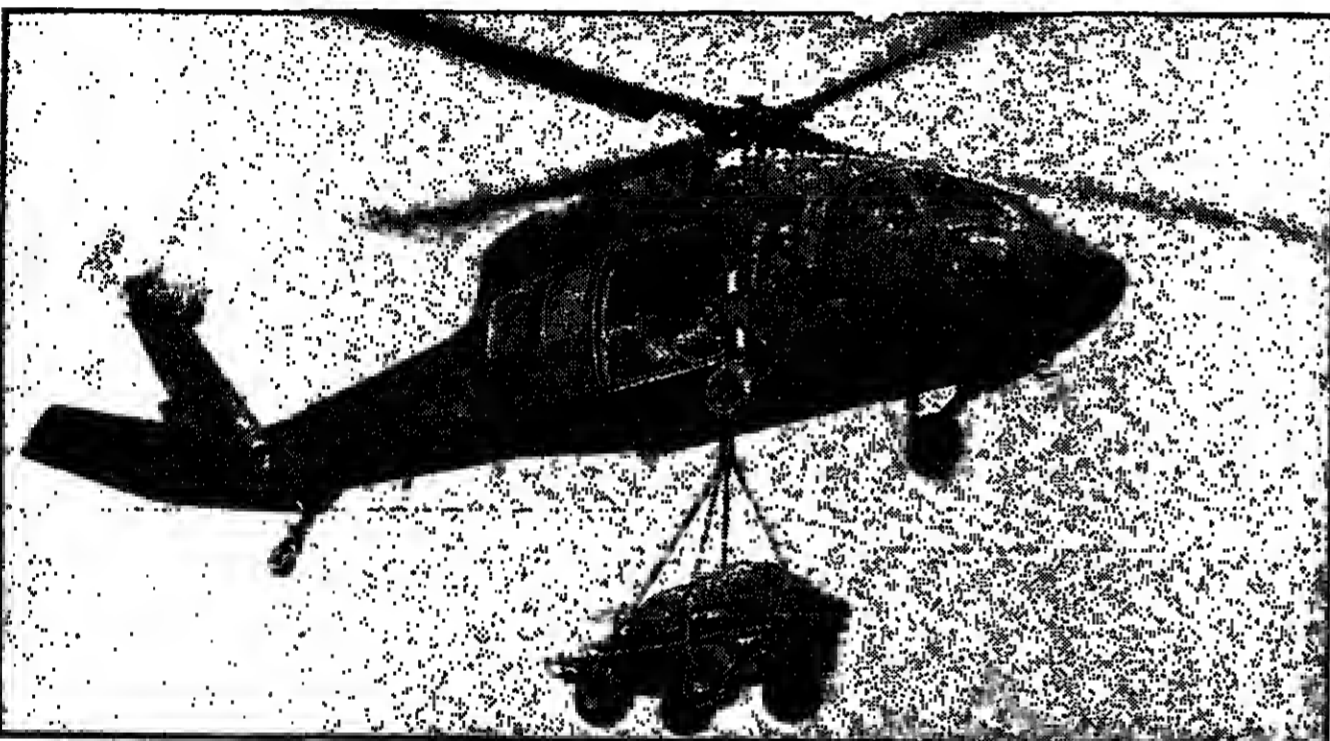
Costs cut through collaboration



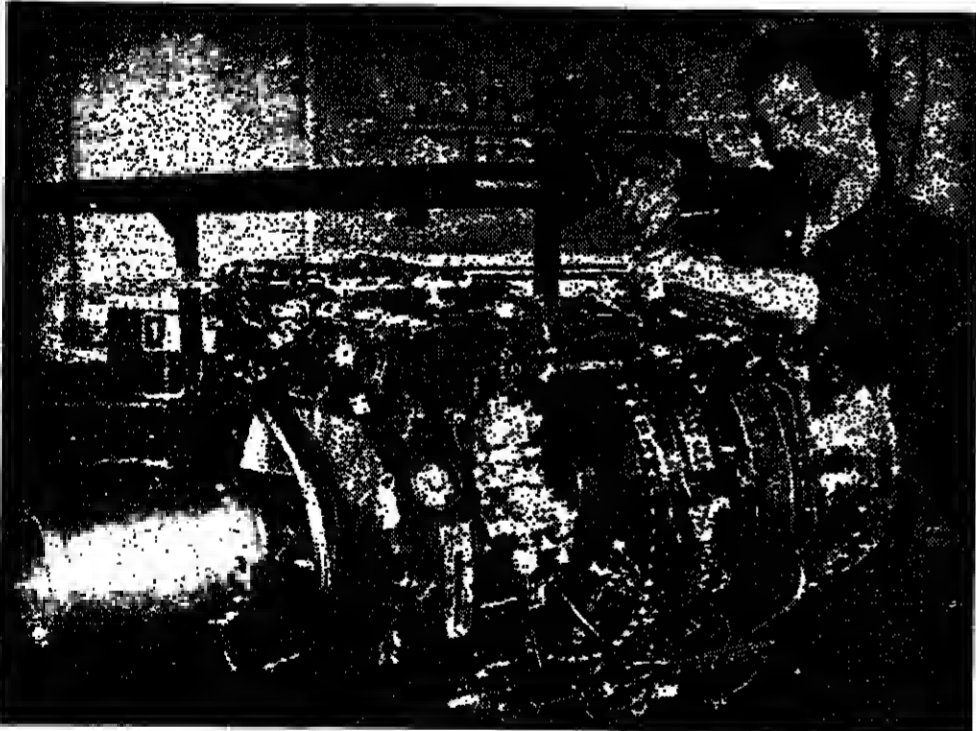
The Westland Lynx 3 helicopter set a new world helicopter speed record of 249.10 mph earlier this month, beating the previous record of 228 mph held by the Soviet Union



The Sikorsky X-wing experimental rotorcraft was rolled out earlier this month in the US. The artist's conception shows how an eventual adaptation of the concept to a fighter aircraft may look



Above: the US Army/Sikorsky UH-60 Black Hawk. This versatile helicopter, made in a number of versions including transport, combat and search and rescue, could be ordered by the UK as an Army tactical transport and support aircraft. This prospect is increased by this year's acquisition by United Technologies (Sikorsky) of a financial stake in Westland.



Left: Rolls-Royce and Turbomeca of France have jointly developed a major new helicopter engine, the RTM-322, which could be used in a wide range of rotorcraft in the years ahead. Its "core" could also be adapted for other types of engine.

DESPITE difficulties in world markets stemming from a short-term decline in civilian orders, especially from offshore oil customers, and a hiatus in military buying while major new programmes are established, particularly in the US, the long-term prospects for helicopters remain bright.

The exceptional versatility of this type of aircraft guarantees that between now and the end of the century it will remain in demand. However, the high costs of development and manufacture are already ensuring that the major new programmes now evolving are essentially collaborative, both on an inter-company basis (as in the US) and on a wider international basis (especially in evidence in Western Europe).

This collaboration is designed to damp down to some extent the over-capacity problems that have bedevilled the helicopter industry in recent years, giving rise to fierce competition for sales.

Even so, it seems likely that the battles for world markets will be undiminished in ferocity, and all eight major manufacturers — Bell, Boeing-Vertol, Sikorsky and McDonnell Douglas in the US, Westland in the UK, Agusta in Italy, Aerospaciale in France and Messerschmitt-Bolkow-Blohm in West Germany — will be operating from now on in a much tougher environment.

So far as Westland is concerned, following the financial reconstruction earlier this year when Sikorsky of the US and Fiat of Italy acquired financial stakes in the company, the task is now to rebuild its industrial base.

Mr Hugh Stewart, group chief executive of Westland, points out that although United Technologies of the US (parent of Sikorsky) holds about 21.4 per cent of the nominal value of Westland shares, it holds about 18.5 per cent, in terms of voting shares UTC holds about 9.5 per cent and Fiat about 5.3 per cent.

"Thus, in terms of control, the combined UTC/Fiat holding is now approximately 14.8 per cent," Mr Stewart says.

Currently, the Westland business environment is complicated by three factors: the aftermath of the financial reconstruction; the effects of reductions in home defence spending by the Ministry of Defence; and current over-capacity in world helicopter manufacturing resources.

The main consequence of the reconstruction is that the US Sikorsky Black Hawk, called the WS-70 by Westland, is now part of the Westland's product line. This has the potential for manufacturing work to be carried out in the UK for Sikorsky, the manufacture in whole or in part of aircraft sold by Westland to UK or overseas customers, using the Rolls-Royce/Turbomeca RTM-322 engine.

An important customer, not yet committed for the WS-70 remains the Ministry of Defence.

Westland sees the Ministry of Defence as continuing to be a major customer, accounting for 60 to 70 per cent of all helicopter sales by the company. Over-capacity in helicopter manufacturing continues to be a problem. In the US, the major manufacturers are in a stronger position, substantially supported by large-scale military orders, which helps to reduce costs through large production runs. On the Continent, the major manufacturers are also substantially Government-supported.

Nevertheless, Westland believes that it has some outstanding aircraft to offer—the EH-101 Sea King replacement, with a civil variant also planned; the WS-70 derived from the Sikorsky Black Hawk, which is effectively a new high performance tactical helicopter, especially when fitted with the new RTM-322 engine; and the Super Lynx, an outstanding

light naval helicopter for general-purpose duties.

The Sea King itself, one of Westland's mainstays in recent years, is also still an active programme with aircraft currently being supplied to India for anti-submarine warfare work.

The company's biggest venture for the immediate future, however, is the EH-101, developed under the international agreement with Agusta of Italy through the jointly-owned EH Industries. The first EH-101 will be rolled out in December, with first flight next spring. Nine flying prototypes are to be built, and eventually some 800 aircraft are envisaged. Costs could be as high as £950m for joint development, and £550m for UK production alone.

The EH-101 — designed for all-weather day and night operations in a wide range of anti-submarine, anti-surface ship, search and rescue, replenishment, airborne early warning and electronic counter-measures roles — has long endurance and can operate from both land and ship-borne bases.

The civil market is regarded as especially important for the EH-101, primarily with opera-

land sees no reason why it should not at some stage participate in plans for the international development of a multi-role helicopter, the NH-90, for the 1990s, if that venture matures. So far, it is only in the feasibility study stages, between the UK, France, West Germany, Italy and Holland, and no decisions to go further into project definition have yet been taken. But it could yet prove to be a major project for the 1990s.

Also, Westland is involved with Agusta of Italy on the plan to develop a new Light Attack Helicopter (LAH), from the current Agusta A-129 Mangusta helicopter, probably with the participation also of Holland and Spain.

The fact is that, despite the financial and political difficulties of the latter part of 1985 and early into 1986, Westland has survived as a manufacturing entity in the world helicopter industry. Its present management intends that it will stay in that league.

It is justified in that view in its estimates of future world helicopter markets. Despite difficulties in the past few

years, the longer-term future is seen as bright. Although civil markets are still slow to develop, eventually it is believed they will match, if not exceed, military markets.

For the immediate future, the latter are the more promising. Westland sees overall markets (outside the US and also the Soviet Union and other Eastern bloc countries) amounting to more than £200m for military helicopters of all kinds, covering over 9,000 aircraft, up to the end of this century.

These include up to 1,500 naval helicopters worth about £50m in the Lynx/Sea King/EH-101 category; 3,100 aircraft worth £100m in the Army support category; some 2,000 aircraft worth £40m in the Army attack helicopter class; and about 2,500 worth £1.5m in the light military class.

Many of these fields are likely to be dominated by exports of US helicopter types, however, especially if such major US programmes as the LHX (Light Helicopter Experimental) fully mature. Up to about 5,000 of these aircraft are likely to be ordered through the rest of this century, making it the most lucrative helicopter programme anywhere in the Western world.

Two major groups are bidding for the contract—Boeing Vertol and Sikorsky Division of United Technologies, against Bell Helicopter Textron and McDonnell Douglas Helicopters.

Many other major equipment, component and auxiliary suppliers in the US aerospace industry are lining up behind one or another of these two teams, and the final competition will be one of the most

ferce procurement battles ever fought in the US.

The Boeing Vertol/Sikorsky team also includes Martin Marietta, Northrop, Rockwell International, Spang, TRW Military Electronics Division, Hamilton Standard and Werdinghouse Defense and Electronics. The Bell/McDonnell Douglas team includes Honeywell, Hughes Aircraft, Sperry Corporation, Texas Instruments and others.

On each side the line-up is formidable, across the entire spectrum of aerospace technological disciplines. Current plans envisage a decision on full-scale development by the US Army during 1987, with first flight of the winning helicopter in 1991. If Sikorsky and Boeing Vertol win the contract, there is every prospect of some LHX work coming to Westland in the UK.

The Rolls-Royce/Turbomeca RTM-322 engine already mentioned represents a major bid to win massive engine markets in helicopters both at home and overseas.

Fight trials of this engine (which could also be adapted for other uses) began earlier this summer in a Sikorsky S-70C aircraft, the civil variant of the US military Black Hawk.

Potential applications for the RTM-322 include both the US Black Hawk and Sea Hawk helicopters now in service with the US armed forces; the Anglo-Italian EH-101, the Westland 30, the prospective European NH-90 Nato helicopter for tactical transport and other duties, and a single-engine version of the Italian Agusta A-129 for anti-tank and other roles.

The RTM-322 programme is funded by Rolls-Royce and Turbomeca, with support from both the UK and French Governments.

The RTM-322 engine is also a possible candidate for re-engineering the McDonnell Douglas AH-64 Apache helicopter, now used extensively by the US Army. This engine fits beautifully into the AH-64, according to Bell Helicopter. Helicopters and would increase its power from 1,700 shp to 2,000 shp.

Among other major helicopter developments that could transform the future of rotary-winged flight is the recent US Naval Air Systems Command decision to place a \$1.7bn seven-year contract to the joint Boeing Vertol-Bell Helicopter Textron team for the development of the V-22 Osprey tilt-rotor aircraft.

This machine is designed to take off and land like a helicopter but also to fly like a turboprop aircraft in conventional forward flight, reaching speeds of more than 300 mph and altitudes close to 30,000 feet. It is intended for both military transport and for civilian applications.

Initially, the development programme calls for the first flight of the V-22 by June, 1988, with production deliveries beginning in December, 1991, to the lead service, the US Marine Corps.

Current plans call for the eventual production of 1,219 Ospreys for the US Marine Corps, Navy, Army and Air Force, for wide-ranging roles including combat assault, support, search and rescue, anti-submarine warfare and special support operations.

Future commercial versions of the Osprey could efficiently support long-range offshore oil exploration activities and permit fast, effective city centre to city centre operations, by-passing congested airports and ground traffic delays. Such airline-style versions of the mid-1990s.

US aviation analysts have estimated that the world market for commercial tilt-rotor aircraft now ranges from 4,000 to 10,000 aircraft up to the end of this century.

Michael Dome

The battle for world markets by the eight leading makers is undiminished in ferocity

tions in the offshore oil industry in mind, in such areas as the North Sea, the Canadian Arctic and South America and Antarctica. But it is believed that opportunities will also develop in the civil commuter market and elsewhere, so that eventually between 300 and 400 civil EH-101s will be built, or almost half the total market for the aircraft.

A possible further variant is the Utility model, for tactical use by land forces, which could generate a market for 250 or more aircraft. Westland says that with the EH-101 it is making a vigorous bid for civil helicopter markets worldwide.

Another possible Westland civil venture is the W-30/300, a version of the original W-30 transport helicopter, of which in turn other versions are in production for the Helicopter Corporation of India and in service with Omni-Flight of New York and British Airways Helicopters (recently sold to Mr Robert Maxwell). The W-30/300 has already flown, but it is not intended to manufacture it speculatively.

Mr Hugh Stewart comments that "if we find a customer who wants the Westland W-30/300, and the order is big enough to justify launching the aircraft, we will launch it and that does not in any way conflict with the Black Hawk."

"The Westland 30 is the less expensive end of the market and the Black Hawk is at the more expensive end, so I don't think there is any real conflict between the two aircraft. If we look as though we can do good business, we will make them."

Looking further ahead, West-

World market for helicopters (1987-96)

Sector	Weight class				Total
	Light	Inter-mediate	Medium	Heavy	
US Government	—	199	2,215	576	2,975
Foreign military	2,295	1,550	1,720	335	6,130
Worldwide civil	3,109	1,399	229	5	4,715
Total	5,395	3,339	4,155	890	13,299
Source: Sikorsky Aircraft	\$5.1	\$10.9	\$23.7	\$8.1	\$47.8

- AIR DATA COMPUTERS
- ASW MISSION SYSTEMS
- AUTOMATIC FLIGHT CONTROL
- COMBAT RADARS

- COMMUNICATION SYSTEMS
- HEAD UP DISPLAYS
- HELICOPTER AVIONICS
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New shapes

Planning for the Mach 5 airliner

WITH CONCORDE now well into its eleventh year of regular scheduled supersonic air services, and likely to last until the end of this century and well into the next, there have been few suggestions for the development of a possible direct successor.

Although from time to time designs of potential "Mark Two" Concorde have emerged—the most recent being a design study earlier this year by Aerospatiale of France, one of the original Concorde manufacturing partners—the potentially high costs involved coupled with the limited market, have deterred governments, aerospace manufacturers and airlines alike from committing themselves to such a development.

Now, it seems likely that the trend of research into very high-speed aircraft on both sides of the Atlantic could accelerate, to the point where a big leap forward is made. This would bypass any second-generation supersonic airliner, and move instead directly to a new type of even faster "hypersonic" aircraft—that is, capable of flying at more than five times the speed of sound (Mach 5, or nearly 3,400 mph), against Concorde's twice the speed of sound (Mach 2, or about 1,300 mph).

Such aircraft would fly so high (well over 100,000 feet) that they would be close to the fringes of the Earth's atmosphere. From such hypersonic transports, it would not be difficult to develop aircraft that would have the capability of entering low-Earth orbit on ballistic style trajectories to give them even faster journey times.

From that in turn it would be feasible to develop what

effectively would be "aerospace planes" or "transatmospheric vehicles," that could not only be used as transports but also as workhorses in orbit, for surveillance or even satellite launching, while still using runways for taking off and landing like conventional aircraft.

Current research is involved with both forms of vehicle—hypersonic and transatmospheric.

In the UK it is concentrated on the "Hotol"—for Horizontal Take-Off and Landing—a true transatmospheric vehicle, designed to use runways like an aircraft but also to soar into orbit like a spacecraft.

In the US, although research for a long time was widely spread, covering not only hypersonic transport ideas but also transatmospheric vehicles, it has now been officially focused on hypersonic transports through the National Aerospace Plane (NASP) concept.

This, however, could eventually devolve into a family of vehicles, including a true transatmospheric vehicle for reducing the costs of putting spacecraft payloads into low-Earth orbit by the end of this century at cheaper rates than the current Space Shuttle can provide.

As the US Defence Department has stated: "If the new research programme is successful in demonstrating the necessary technologies, an entirely new family of aerospace vehicles will be possible, able to cruise within the upper atmosphere at hypersonic speeds, or ascend directly into orbit."

As a space launch vehicle operating from conventional runways, the fully reusable and single state aspects of the NASP are believed to produce

very large reductions in the cost of placing payloads in orbit.

The UK's Hotol venture, now the subject of a £2m study by British Aerospace and Rolls-Royce funded by the Department of Trade and Industry, is a tubular-looking design for a spacecraft that could take off from normal runways, boost itself into near-earth orbit to perform various missions in space, such as satellite launching, and return to Earth to land like a conventional aircraft.

Although initially intended to be unmanned, the current studies also include the possibilities of a manned variant, with a pressurised cabin replacing the cargo bay.

The Hotol would be fuelled for flight in space by liquid hydrogen and liquid oxygen, although air-breathing engines would also be used for its conventional take-off and landing roles. Because the Hotol is currently the subject of Government-funded "proof-of-concept" studies, details of its design and its power-plants are not revealed, although the latter are claimed to be far in advance of anything yet attempted.

It is suggested that Hotol would have a take-off speed of about 290 knots after a runway roll of about 7,500 ft. The vehicle would be flying supersonically after two minutes, with an angle of climb of about 24 degrees.

It would be clear of commercial air traffic after 4.5 mins (40,000 ft height), and would reach a speed of five times that of sound (Mach 5) after nine minutes' flight. At a height of about 90 km, it would reach orbital velocity, and thereafter its main engine would be switched off so that

it could coast up to an operating height of about 300 km.

A typical mission duration in orbit would be about 50 hours, with position and altitude changes being made by an "orbital manoeuvring system" (OMS). At the end of that time, the OMS would slow the Hotol down, to enable it to return to Earth at a speed slower than that of the US Space Shuttle, for its eventual landing beck at its base, or at some other specially-designated runway.

In its unmanned configuration, Hotol would be remotely controlled by artificial intelligence and robotics systems, but in the manned configuration, the crew would be in command, as with the Space Shuttle.

It is claimed that Hotol will reduce the costs of putting payloads into low Earth orbit by a factor of five, and could as much as halve the costs of putting payloads into higher orbits, such as those that geosynchronous satellites (for example, telecommunications satellites) normally use.

This economy of operation, coupled with quick reaction and a rapid turnaround capability, will enable Hotol to compete realistically for about 75 per cent of the commercial market for launch capability from the year 2000 onwards.

Moreover, it is also claimed that because the Hotol technology is forward-looking, with ample potential for development beyond the cheap and effective spacecraft launcher which is envisaged at present, it could be eventually developed into a commercial transport, capable of passenger flights from Europe to Australia of about one-hour's duration.

At this stage, the progress

being made in the Hotol "proof of concept" studies is not revealed. But at the end of the first six months of these studies, costing an estimated £750,000 shared by the Government through the British National Space Committee and by British Aerospace and Rolls-Royce, the position will be reviewed. If the studies show significant promise, they will be continued.

If the Government is convinced that Hotol has a practicable future, and would not be unduly expensive, further development studies would probably be authorised. Eventually, however, it seems likely that international collaboration on the venture will be sought, primarily in Western Europe where there is already considerable interest in it.

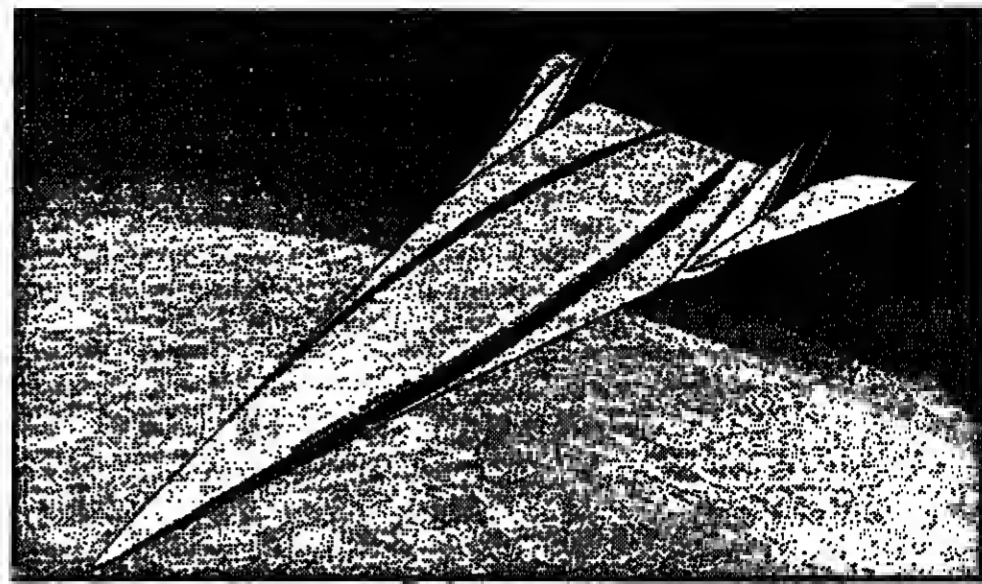
In West Germany, studies into possible future hypersonic flight research vehicles have also been initiated, with a view to determining whether these provide alternatives to the development of the French-inspired Hermes manned reusable spacecraft, planned for launch in 1995, which is similar to but smaller than the US Space Shuttle's Orbiter spacecraft.

One such study is by Messerschmitt - Bolkow - Blohm and ERNO, called Horus (a manned but pilotless Hypersonic Orbital Research and Utilisation System), which would be larger than Hermes. Both Hermes and Horus are intended for launch aboard the advanced European Ariane 5 launcher rocket, but both would land back at base like aircraft.

Whether Hermes and Horus are overtaken by Hotol, or all these ideas come together into one transatmospheric vehicle or "aerospace plane" remains to be seen. But what is clear is that not all of these ideas can be financed in Western Europe, and that the UK could never go ahead with Hotol alone. At some stage in the near future, a major debate on which venture goes ahead in Western Europe, and with whom, must occur.

In the US, work has begun on the X-31 National Aerospace Plane (NASP), a project for a hypersonic (over Mach 5, or nearly 3,400 mph) vehicle for service around the end of this century, that would be capable of both military and commercial operations.

In the initial phase, the Department of Defence and the National Aeronautics and Space



A McDonnell Douglas concept of an "Aerospace Plane" which would be capable of flying at five times the speed of sound, or nearly 3,400 mph, by the year 2000, if current US ambitions are fulfilled

Administration have awarded seven contracts to US aerospace and engine companies, worth about \$900m over a 42-month period, for what is called "key technology validation."

A joint office has been established by the Defence Advanced Research Projects Agency (DARPA), in conjunction with the US Air Force and US Navy and NASA, at Wright-Patterson Air Force Base, Ohio, to manage the programme, in which the US Strategic Defence Initiative Organisation is also involved.

General Electric and Pratt and Whitney, the two main US aero-engine companies, have received contracts worth about \$175m each to study air-breathing supersonic combustion ram-jet engines, capable of powering the transatmospheric vehicle at very high speeds, while air-breathing engines can still function. Aerojet Tech-Systems will be associated with General Electric in the venture.

Other forms of propulsion, using liquid oxygen and liquid hydrogen, for example, will also be studied for possible eventual use in an orbital flight vehicle, although much work has already been done in this field over many years in the existing US space programme, especially in the development of the Space Shuttle.

Airframe companies gaining contracts worth about \$32m each are Boeing, General Dynamics, Lockheed, McDonnell Douglas and Rockwell International.

They will study configuration designs, and the technology required to develop them. At a

later stage, these companies will be reduced in number through a design competition to produce just two or three airframe contractors for the next phase of the programme.

The letter, probably starting about 1990, will involve embodying the technological knowledge gained in the current phase into an experimental flight-test vehicle, by about 1993, before any final development of a full-scale hypersonic "aerospace plane" begins.

The NASP programme is thus still only in its very earliest exploratory stages, with no clear-cut conclusions as to how any vehicle will eventually look, or precisely what tasks it will eventually perform, or how. That is what the 42 months' technology validation phase now starting intends to clarify.

Mr Robert C. Duncan, director of the DARPA told a US Congressional sub-committee on aviation earlier this summer that the NASP programme was aimed at producing a vehicle that had a "highly integrated engine and aircraft structure," a high-temperature metallic structure designed for many flights, a large, highly-streamlined fuselage with integral fuel tanks, and multiple engines and exhaust nozzles.

Until the manufacturers produce their various designs of the projected NASP, few other details of its size or capabilities are likely to emerge. But some of the manufacturers have already given their own individual ideas.

One is McDonnell Douglas, which earlier this year told the Senate sub-committee on

science, technology and space that the NASP programme could result in a transport aircraft that could fly at more than five times the speed of sound, serving both commercial and military transport purposes.

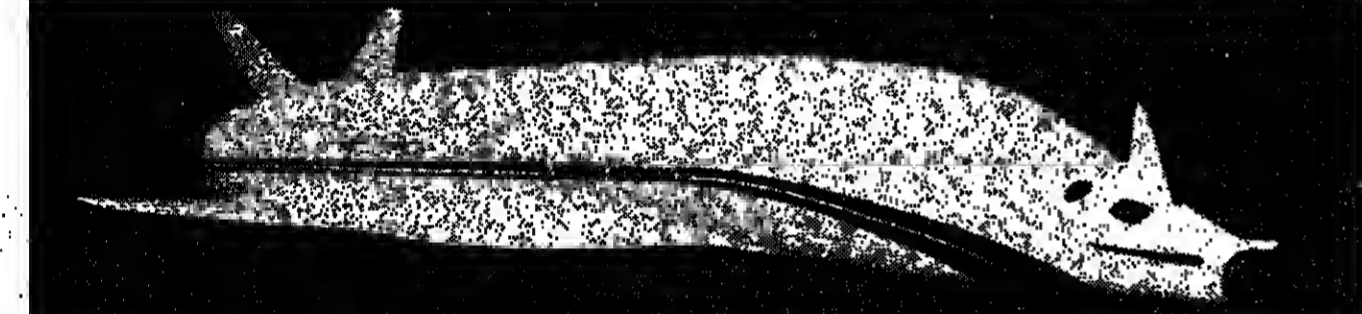
Mr Roger D. Schauffele, vice-president of engineering for the Douglas Aircraft Division, said such a transport, burning methane fuel and using conventional runways for take-off and landing, could carry up to 305 passengers over distances of 6,500 nautical miles, cruising at more than 3,600 mph at heights of over 100,000 feet and bringing Sydney to within two and a half hours of Los Angeles, or Washington within two and a half hours of Tokyo.

Such vehicles could also eventually be used for work in space, delivering payloads such as satellites at much lower costs than the existing manned Space Shuttle transport system.

It has been repeatedly stressed in the US that the NASP programme is the key "to regaining the substantial lead in aerospace once enjoyed by the US"—a reference to US concern at the way in which Western Europe has developed its aerospace potential in recent years.

It is also a reference to the concern now felt in the US at the way in which the Soviet Union has developed a substantial space industry, and is now in a position to build up a commanding lead in manned spaceflight following the recent problems with the US Space Shuttle.

Michael Donne



The British Aerospace/Rolls-Royce Horizontal Take-Off and Landing (Hotol) design for a transatmospheric vehicle is now being studied under a joint financing venture with the Department of Trade and Industry



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Military aircraft

Big budget projects beat the curbs

THE WESTERN world's spending on new military aircraft continues to run at a high level, and between now and the end of this century is expected to amount to more than \$500bn.

Despite pressures on defence spending in some countries, the budgets on both sides of the Atlantic will be dominated by some multi-billion dollar programmes for combat aircraft, strategic bombers and transports, some of which have already begun.

Collectively these will spearhead new advanced technological developments in such areas as materials, production methods, design techniques and even new ways of flying, that will have a major spin-off in commercial aircraft manufacture, and give the aerospace industry as a whole a major new impetus as it moves towards the 21st century.

At the same time, the expansion and re-equipment of many Third World air forces is proceeding apace, and will account for a continuing substantial share of the estimated military spending over the next decade and a half.

This growth is being accompanied by an expansion of inte-

rest in aerospace manufacturing in many Third World countries that have not hitherto had such industries as their own — partly because of the recognition that aerospace enhances any nation's technological base, but also because such industries can now often be developed through offset deals on military aircraft purchases.

In Western Europe, attention is focused on the new generation of combat aircraft now planned for the 1990s and beyond — the Eurofighter now in the project definition phase by the UK, West German, Italian and Spanish industries, and its rival, the French Dassault-Breguet Rafale in which Holland, Belgium and Norway may also participate.

The French Rafale "technology demonstrator" has already made its maiden flight. The UK's Experimental Aircraft Programme (EAP), delayed for some weeks because of labour problems at British Aerospace's Warton factory and also some minor technical snags has now flown.

Over the next few years, nati prototypes of both the Eurofighter and the Rafale become

available, these demonstrators will effectively prove in operation the advanced technologies of the more advanced aircraft to follow.

Project definition of the Eurofighter is now well advanced, and is due to be completed in September. The four nations involved will then submit the project for government approval, and full go-ahead.

The Eurofighter design is for a single-seat, twin-engine, delta-winged aircraft with a small canard fore-wing, for the air-to-air combat role but also capable of fulfilling air defence and air-to-surface (ground attack) roles.

The planned programme comprises about 800 aircraft for the air forces of the four nations (probably about 260 each for the UK and West Germany, about 160 for Italy and about 100 for Spain), with the industrial participation agreed at 33 per cent each for the UK and West Germany, 21 per cent for Italy and 13 per cent for Spain.

A company called Eurofighter Jagdflugzeug GmbH has been set up in Munich to manage the venture, jointly owned by Aeritalia, British Aerospace,

CASA of Spain and Messerschmitt-Bölkow-Blohm. A comparable four-nation joint company (not yet named) to build the new 20,000 lb thrust engine (based on the UK's XG-40 venture) has been formed by Rolls-Royce, Fiat Aviazione, Motoren und Turbinen-Union and SENER of Spain.

Mr Gerrie Wilcox of British Aerospace is managing director of Eurofighter, and Mr Colin Green of Rolls-Royce is managing director of the engine company.

Eight prototypes will be built to fight test the entire Eurofighter weapons system and it is intended that production aircraft should go into service in 1995.

In technical terms, the aircraft will have a basic mass weight of 17.5 tonnes, and a wing area of 80 square metres, with each engine delivering about 20,000 lbs thrust.

The Air Staffs of the four countries have agreed on the equipment to be used in the aircraft and once formal full go-ahead has been given, it is expected that a vast number of equipment and component suppliers in the four countries will be invited to submit competitive tenders for that equipment, including the avionics.

It seems likely that consortia of companies will be encouraged to undertake specific equipment items, as has been the case with the existing Tornado.

The "technology demonstrators" for both aircraft have now flown the Experimental Aircraft Programme (EAP) in the UK having been delayed for some weeks through industrial problems at British Aerospace's Warton factory.

The Eurofighter will thus provide employment for many thousands of workers throughout the West European aerospace industry, for many years to come, for it will remain in production through to the end of the century and beyond. If exports are taken into account, total production could go well beyond 1,000 aircraft — the Tornado is already close to that figure.

The Eurofighter will come into production in the early 1990s, just as Tornado is running down the last of its military aircraft quantity production costs assured.

The cost of the total Euro-



A Lockheed-California Company artist's conception of how the future US Air Force's Advanced Tactical Fighter (ATF) might look



The Grumman E-2C Hawkeye Airborne Early Warning and Control (AWACS) aircraft, for detecting and locating hostile aircraft, in service with the US Navy, has been offered to the UK as an alternative to the Nimrod project. Another Grumman proposal is to fit the Hawkeye's radar and other avionics systems to the Nimrod airframe — the Hawkrod

sub-contractors. McDonnell Douglas and Northrop have joined forces in a similar group to fight for the ATF.

The US Air Force is also studying a new advanced tactical bomber (ATB) programme, that could cost as much as \$50bn eventually. Primarily designed by Northrop, this aircraft is intended to become operational in the early 1990s, but there is still no formal commitment to the venture by the USAF.

An Advanced Tactical Aircraft (ATA) for the US Navy is also currently under study, which would also be a multi-billion dollar programme.

The UK and the US are also now involved in a joint study of a wide range of airframe and engine technologies that could lead to an advanced supersonic short take-off and vertical landing (ASTOVL) aircraft by the mid-1990s.

A memorandum of understanding between the two countries for this purpose was signed earlier this year, and the broad objective is to define the technologies that such an aircraft might require. It is not yet a formal programme to develop a new jump-jet fighter to replace the existing Harrier, although it could eventually lead to such a joint programme.

Much of the work under the MoU is devoted to exploring new

power-plant concepts for such an aircraft. The next logical step following this research programme could be an experimental aircraft development venture, jointly funded to test the concepts in flight, but this is not immediately in prospect.

A new generation of transport aircraft is also now looming large in US military thinking. McDonnell Douglas has a \$2.4bn USAF contract for full-scale development of the USAF's new C-17 long-range four-engine airlifter, of which eventually 210 will be built.

Assembly of the test aircraft will begin in 1987, and assembly of the first production aircraft in 1988. Entry into service will be in 1992, and completion of the order is set for 1999.

Where transport aircraft are concerned, the independent short take-off and vertical landing (ASTOVL) aircraft by the mid-1990s.

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the end of the century. This FLA study is independent of an industrial-based study called FIMA (Future International Military/Civil Aircraft) in which Aerospaciale, British Aerospace, Lockheed and Messerschmitt-Bölkow-Blohm have been involved. McDonnell Douglas of the US also has a study for an Advanced International Military Short Take-Off and Landing Airlifter (AIMSA).

Whether all these ideas can at some stage be brought together in one coherent international military programme remains to be seen.

What is clear is that not all of them will ultimately be developed — the demand is not sufficiently great, and the costs would be prohibitive. The most ambitious objective would be for the FLA and the FIMA projects to be brought together, under NATO auspices.

If an in-service date of about the year 2000 is postulated, full development would need to be established by 1994, which indicates that firm commitments would need to be taken between then and 1990, which in turn indicates an increasing level of government and aerospace industry interest in such aircraft over the years immediately ahead.

Michael Dome

Missiles

Pace of change brings problems

MISSILE development is changing rapidly in response to more complex demands by armed forces. The pace of change has led to problems for manufacturers and the future of some recent projects has been in the balance.

Artificial intelligence is becoming a prime target for aerospace companies developing guided missiles. Ideas on the drawing boards of several missile manufacturing companies include missiles to recognise and attack targets autonomously, operating completely independently of the launch aircraft or ground battery.

Advances in electronics, with smaller, higher-speed semiconductor circuits and more ingenious computer software, have led to these intelligent missiles. The missiles operate alone after launch, but the high cost of their development has led to a parallel move by cost-conscious defence departments towards smaller, simpler and faster hit-to-kill weapons. These make direct hits on targets.

The AMRAAM, advanced medium range air-to-air missile, is one of the new generation of intelligent missiles and is made by Hughes and Raytheon of the US. It is potentially one of the most important guided missile projects to emerge in

recent years. It could become the West's main medium range air-to-air weapon, but has been racked by problems.

The AMRAAM programme has been criticised by the US Congress as too expensive and Congress withheld funds for its development.

Earlier this year, Mr David Packard, the chairman of the Packard Commission which investigated defence systems procurement procedures in the US, described AMRAAM as a "goldplated weapon, built with too many capabilities at too high a cost."

The commission called for Pentagon authority over weapons development to be moved from the Defence Systems Acquisition Review Council to a more powerful Joint Requirements and Management Board. This board would seek to increase of the shelf purchasing and stop the "goldplating" of weapons with superfluous technology, the commission recommended.

In tests, the missile has hit a manoeuvring target after being launched from a manoeuvring aircraft.

AMRAAM is supposed to go into full-scale production in April 1987. The first two years of production will be by Hughes and Raytheon. This will be followed by an open competition

for the full-scale production of the missile.

The pace of change in missile design is illustrated by a comparison between a current weapon, such as the Hughes HARM missile, and an advanced missile still at the development stage, such as AMRAAM. Phoenix contains the electronic equivalent of about 4m transistors. AMRAAM contains the equivalent of 7m transistors.

Other innovations include the use of optical fibres for the secure transmission of data to and from missiles, to make it impossible for an enemy to jam missile control systems. Guidance data for a missile could be transmitted down high-strength optical fibres instead of down the metal wires used at present on several anti-tank missiles.

In Europe, missile manufacturers have had their problems. British Aerospace, for example, has had difficulties with its air-launched anti-radiation missile, Alarm. Anti-radiation missiles are designed to home on the radiation from surveillance radars.

The Alarm missile is being developed in a £200m fixed-price Government contract, but it has problems with its new two-stage solid rocket motor the Nutch. This has been developed by Royal Ordnance Explosives division, the Government-owned arms and munitions company, whose site on the Stock Exchange was postponed earlier this summer.

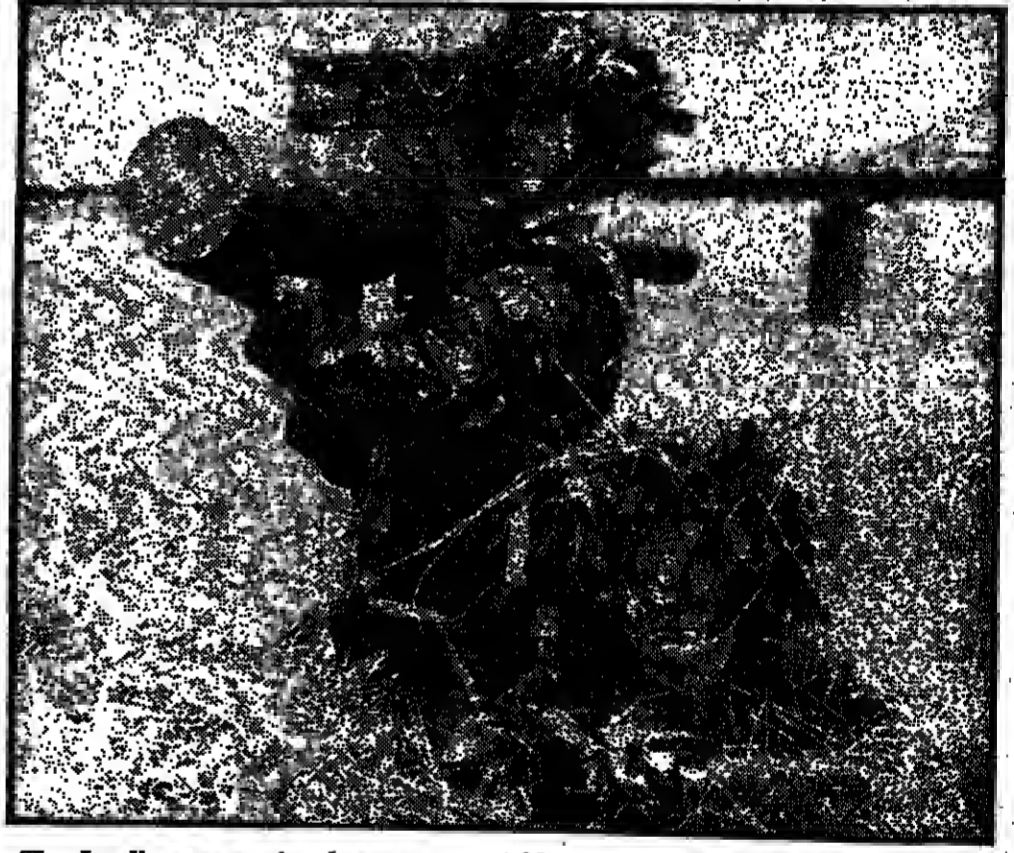
The original contract for rocket motor development was let by BAE to the former Government-owned Propellant, Explosives and Rocket Motor Establishment PERME was subsequently taken over by Royal Ordnance, which is still owned by the Government after the abortive attempts to privatise the company with a stock exchange flotation this summer.

The first of 750 Alarm missiles are supposed to be in service with the Royal Air Force late next year.

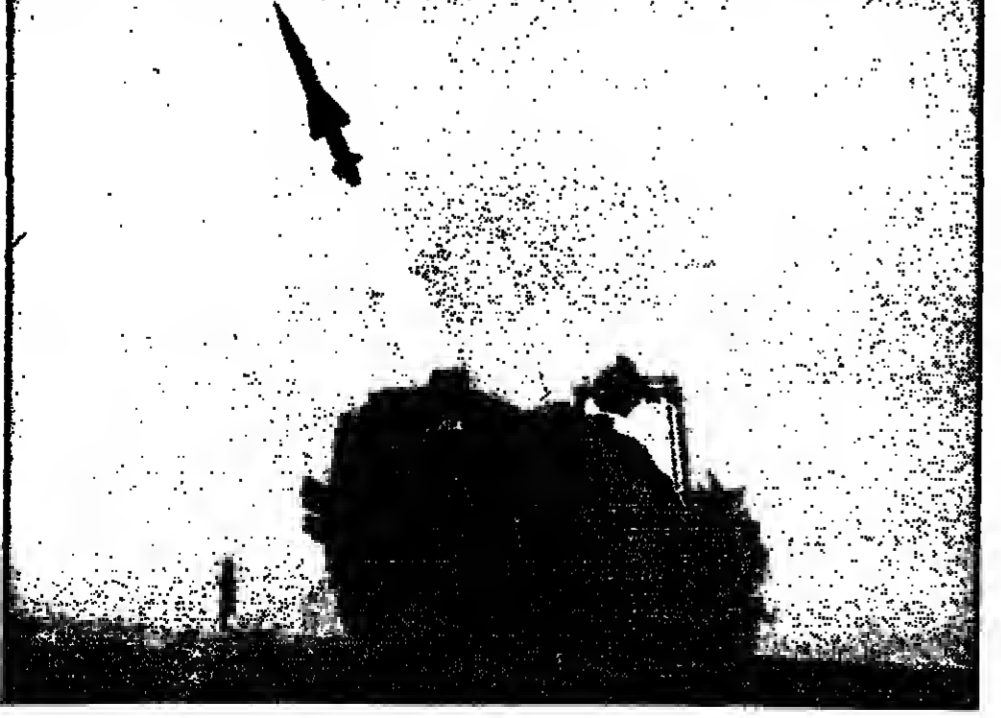
British Aerospace was unsuccessful in its bid for a lucrative West German contract for anti-radiation missiles. In May, West Germany ordered the Texon Instruments' HARM high-speed anti-radiation missile. West Germany has a requirement for up to 9,000 missiles.

In the UK the development is continuing of portable anti-aircraft missiles able to be launched from the shoulder by one man. The Ministry of Defence has a requirement for a high-velocity missile, to be used from a light multiple launcher.

The MoD considered pro-



The Javelin supersonic, close-range portable guided weapons system, made by Short Brothers, is designed to meet the widest range of low-level air defence requirements



The British Aerospace Tracked Rapier anti-aircraft missile, now in service with the British Army

posals from British Aerospace for its Thunderbolt high-velocity missile designed as a close-range weapon for use on heavily armoured helicopters and low-flying aircraft and from Short Brothers of Belfast for the Starstreak high-velocity missile.

At the British Army Equipment Exhibition in June, the Master General of the Ordnance, Lt-Gen Sir Richard Vincent, said that the Short's Starstreak missile an Alvis Stormer vehicle had been chosen to meet the Army's requirement for a high-velocity anti-aircraft missile.

The MoD is considering fitting British Aerospace Sea-World short-range anti-missile missiles to the Royal Navy's three aircraft carriers and some Type 42 destroyers. The company's naval weapons division was awarded a £400,000 contract in the spring to study how Sea-World could be developed with a lightweight launcher.

The company is already developing and test-firing its vertical-launch version of Sea-World for development and production awarded by the Ministry of Defence. The missile is launched vertically so it can turn in any direction towards its target through 890 degrees.

This system is to be installed on the Royal Navy's new type 23 frigates and on the auxiliary oil replenishment vessels.

British Aerospace received a £440m contract from the MoD for kits to upgrade existing British Army Rapier surface-to-air missile systems to the improved Darken standard. Darken is a version of the Rapier and is equipped with thermal imaging guidance for passive day/night clear weather operation.

The advances in missile technology have not made gun and shell technology redundant. British Aerospace has a private joint venture development with the Italian defence equipment company OTO Melara, for enabling the trajectory of gun shells to be corrected in flight. The 76mm calibre corrected shells have small rockets, controlled by radio, to give greater accuracy against moving targets.

In the US, the Strategic Defence Initiative Organisation is at the focus of advanced technology development. The "Star Wars" office is to fund an electromagnetic launcher experiment, involving so-called "railguns," in mid-1988 to demonstrate hypervelocity (over 10 km/sec) and high repetition rate launching of projectiles weighing up to a kilogram.

The MoD considered pro-

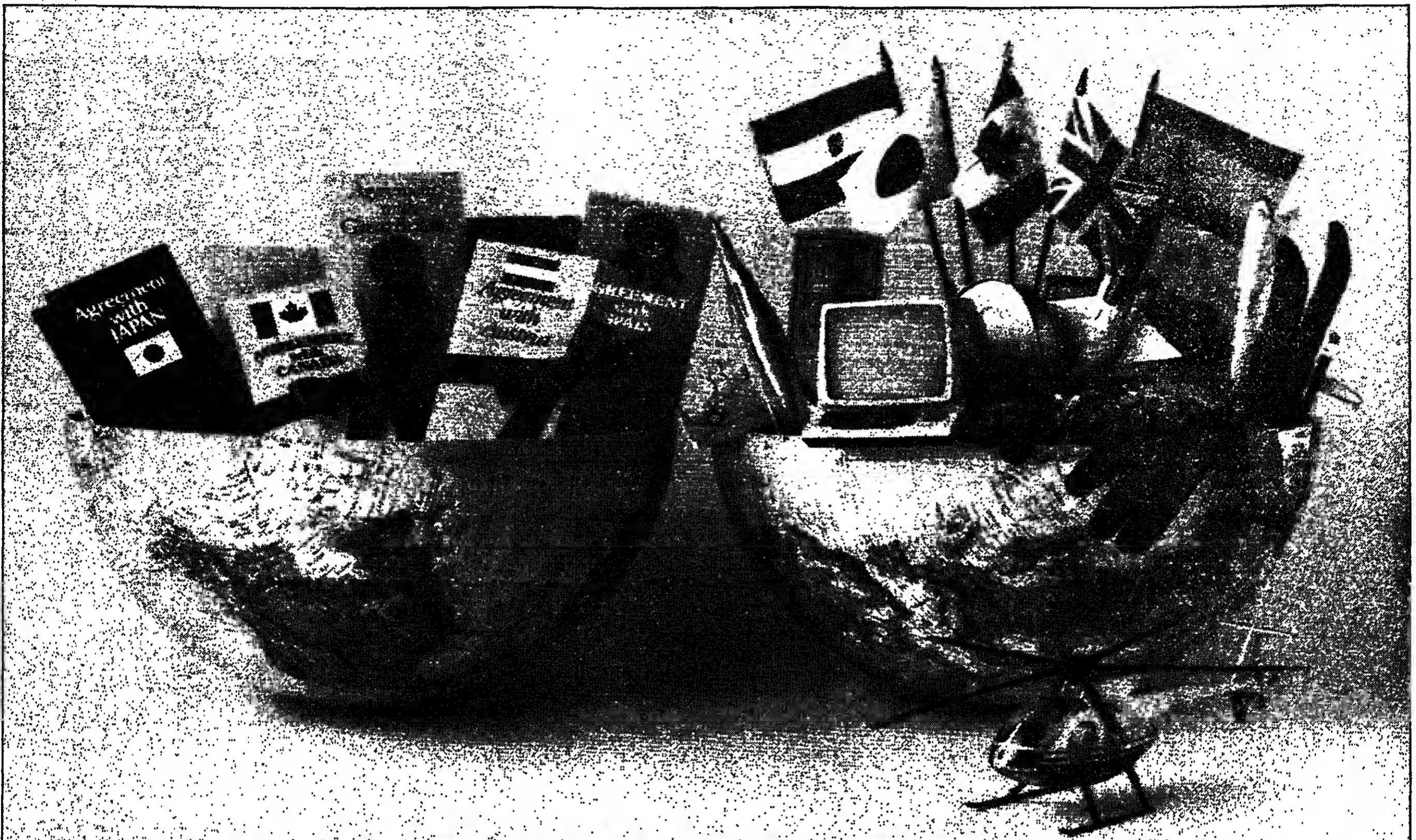
versions, a ground-to-air missile with a range of about 16 miles and a seven-mile range ship-launched missile for defence against sea skimming missiles.

Matra, the French manufacturer of guided missiles, has an ambitious programme of development to meet demand in the 1990s. The company has in production, or is developing, about a dozen missiles for the next decade, including the MICA air-to-air missile to be completed by 1990. MICA is to compete for export sales with the AMRAAM and ASRAAM.

France wants to equip its navy with an advanced anti-missile system in the 1990s, with a range of 15 km. Thomson-CSF is the prime contractor for the surface-air anti-missile system, SAAM, and is designing the radar and fire control system for the missile. Matra and Aerospaciale are competing to make the missile. Aerospaciale is offering its Aster missiles and Matra is offering versions of its SAMAT.

In Canada, the national defence department earlier this year chose a team led by Oerlikon-Bührle and Litton Systems Canada to produce its Canadian \$800m low-level air defence system. The proposals were based on the air defence anti-tank system (Adats) developed by Martin Marietta for Oerlikon.

Lynton McLain



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MCDONNELL DOUGLAS

Business aviation

Marked decline in US sales

BUSINESS AND general aviation has faced two major developments in the past year.

In the UK, the most controversial issue has been the civil Aviation Authority report, CAP 522, on runway and airport capacity in the London and south east area.

In the US, home of the world business and general aviation industry and source of the majority of aircraft owned or used by companies for business, sales of new aircraft have stagnated and in some cases fallen by their greatest amount since the second world war.

The Civil Aviation Authority, in its final advice to Mr John Moore, Secretary of state for Transport on the subject of air traffic distribution in the London area, recommended a total ban on business aviation movements at Heathrow and Gatwick airports during the hours that these airports would be at full capacity as indicated in the airline scheduling committees' plans.

The British Airports Authority, the Business Aircraft Users' Association and the scheduling committees did not agree with such a ban and said so in their submissions to the Secretary of State for Transport.

Government's decision in response to the CAP 522 report, said that the Government would give priority to passenger airlines at peak hours by banning general, business and all-cargo flights at Heathrow and at Gatwick at those times. The Government reserved the right to make exemptions.

The Government considered that there should be no additional rules on restraining aircraft until it became absolutely necessary — that is, when existing runway capacity was saturated.

It wanted the existing system of allocating take-off and landing slots by the airports' and airlines' scheduling committees to continue, to meet the problems caused by steadily-rising demand.

In the meantime, the Department of Transport has identified the need for a further examination of the use of runway capacity at the London airports and has asked the CAA for a special study.

The Business Aircraft Users' Association, in a letter to its members shortly before the Government response was announced, said it would be a mistake to consider the issue a problem solely for users of Heathrow and Gatwick, "or that business aviation itself in fact

poses a serious problem at these two airports."

The association argued that it had been possible so far to accommodate the needs of business aviation at Heathrow and Gatwick, "despite planned full-capacity by scheduling committees."

Business aviation is the sector of general aviation concerned with the operation of aircraft by companies for the carriage of passengers or goods as an aid to the conduct of their business. Members of the association include leaders of industry and commerce and "the principal creators of wealth and employment," the association told the Secretary of State.

Mr Derek Leggett, chief executive of the Business Aircraft Users' Association, criticised the CAA for "unnecessarily, too quickly and too arbitrarily" taking the soft option by recommending that business aviation should be banned from Heathrow and Gatwick during hours to be decided by the scheduling committee.

The association was prepared to accept, "when demand temporarily outstrips capacity," a system of allocation of use based on historic patterns and ratios. These would spread the allocation of the temporary

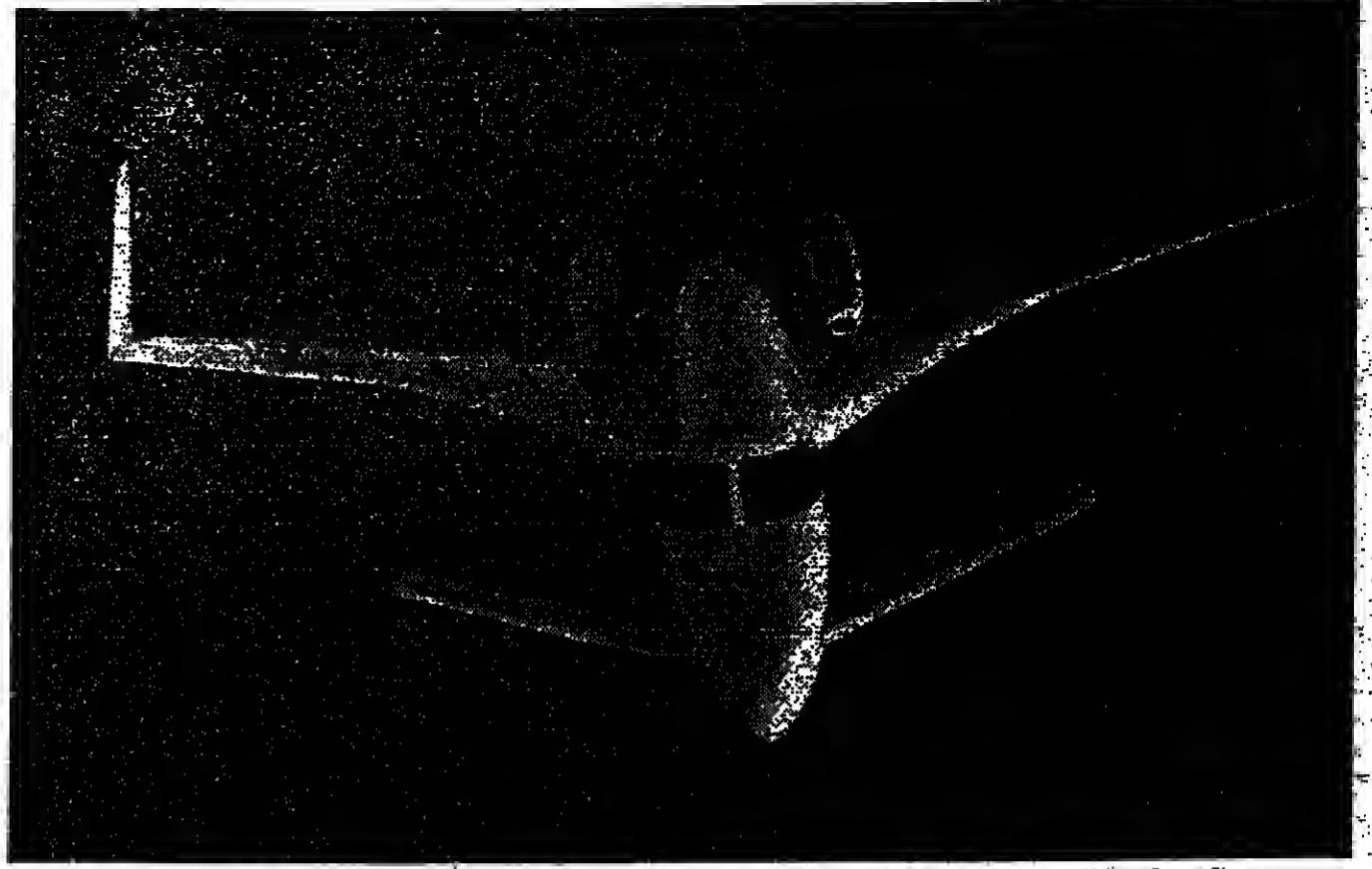
shortage proportionately among the classes of operators. The association was firmly against any limitations imposed artificially on the basis of class or category of operation.

Business aviation users point out that they need to retain fair access to Heathrow and Gatwick airports. Connection with world airlines is often necessary and some business aircraft have radio aids that can only be used at Heathrow.

The industry has not ruled out the development of suitable relief airports for business traffic in the London area and would encourage these airports to be used by business aircraft, but it wants relief airports to be considered with much greater urgency.

These airports would have to be properly equipped and provide the same margin of safety for operation in all-weather conditions as the major metropolitan airports.

In the general aviation sector in the UK, traffic has been falling in recent years, with an 11 per cent decrease in the total number of general aviation aircraft movements in South East England since 1980, according to figures from the CAA. There was a total of 1.4m movements in 1980 compared with 1.2m movements last year.



The Beech Starship I is a revolutionary design concept for business and executive aircraft now under development. First deliveries are scheduled for mid-1987

In the US, the biggest single market for business and general aviation aircraft, sales of new aircraft excluding helicopters have fallen sharply this year, with few signs of a recovery.

In the first half of the year, the US general aviation industry reported the delivery of 649 aircraft worth \$409.1m. The results represented a decline of one-third in the number of aircraft sold compared with nearly 1,000 sold in the first half of last year.

The sales value of the aircraft in the first half this year was almost 40 per cent down compared with the corresponding period in 1985, according to the US General Aviation Manufacturers' Association.

Single-engine aircraft deliveries, at 483 aircraft delivered, were down 25.7 per cent on the first half last year. A total of 43 twin-engine piston aircraft were delivered, a decline of almost 60 per cent on the period last year.

Business jet and turboprop aircraft accounted for 37 and 86 deliveries respectively, down 43.0 per cent and 43.4 per cent on the period last year.

Three makers delivered fewer than five aircraft in the first quarter 1986: Gates Learjet delivered two Lear 35A business jets; Gulfstream Aerospace delivered two Gulfstream three large business jets and a Commander 1000 turboprop; Fairchild Aircraft delivered four Metro 3 commuters.

Despite the current poor

sales outlook, some manufacturers continue to develop new types.

Gulfstream has begun production of its new Gulfstream 4, expected to receive FAA certification in September. The company has \$1.5m backlog of orders for the aircraft.

Beech of the US has produced its revolutionary Starship business turboprop made with a completely composite structure. The aircraft has two rear-mounted pusher propellers and highly-swept wings with a foreplane ahead of the main wing.

The aircraft uses 25 per cent less fuel than a comparable business jet, according to Beech, and is designed to carry eight to 10 passengers over a distance of 2,250 nautical miles.

The US business and general aviation industry has been faced with a proliferation of product liability lawsuits. These have been given by the main manufacturers of general and business aviation aircraft as the single biggest hurdle to overcome if sales of light aircraft are ever to be restored to anything like their usual levels. Few observers believe that this return to high sales is likely in the foreseeable future.

A typical comment on the impact of the product liability

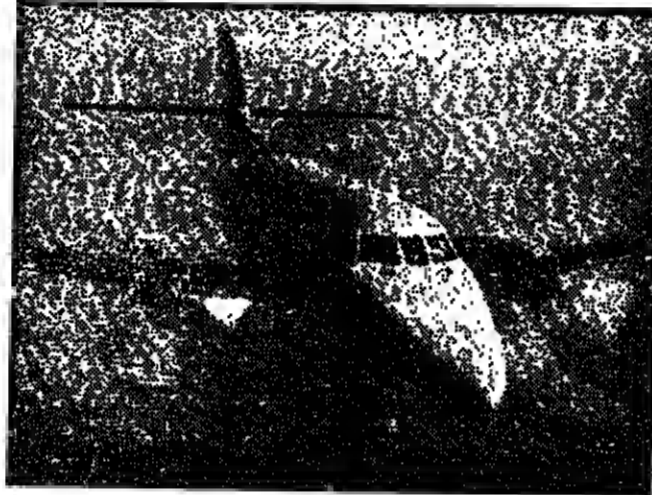
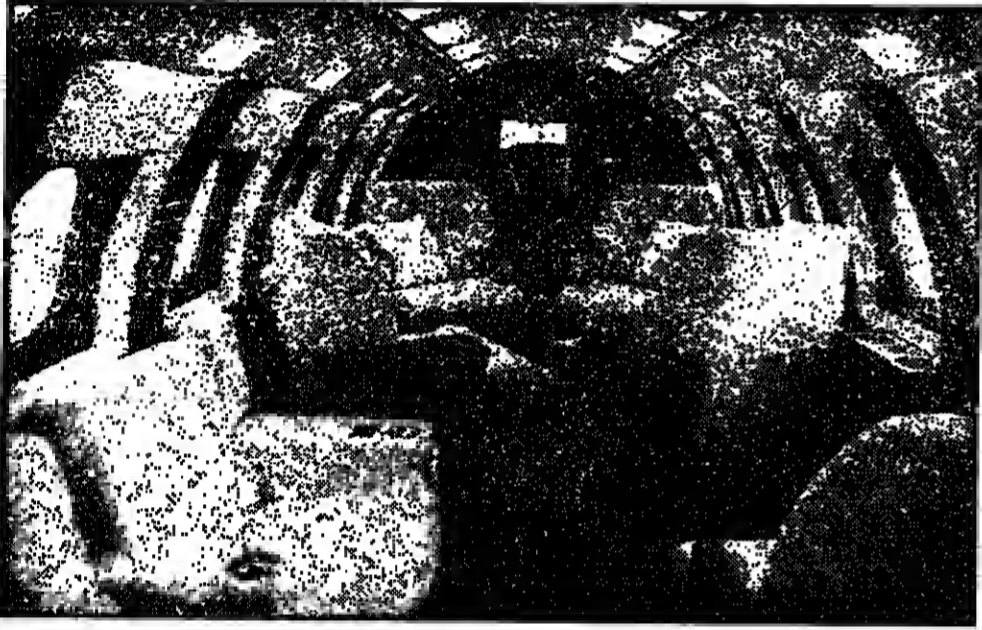
lawsuits on sales of general aviation aircraft and their equipment came from Mr Frederick Sonntag, president of Unison Industries, in evidence to the US House sub-committee on transport, aviation and materials.

The company makes magnetos and ignition wiring for general aviation aircraft, but recently scrapped a year's engineering research on a new electronic ignition product.

"The reason we did so," he said, "was not economic or technical. We were mostly concerned with the potential product liability risk of such an innovative product. We were afraid of becoming a technological pioneer and potentially subjecting ourselves to some plaintiff's attorney second guessing our decision in a lawsuit."

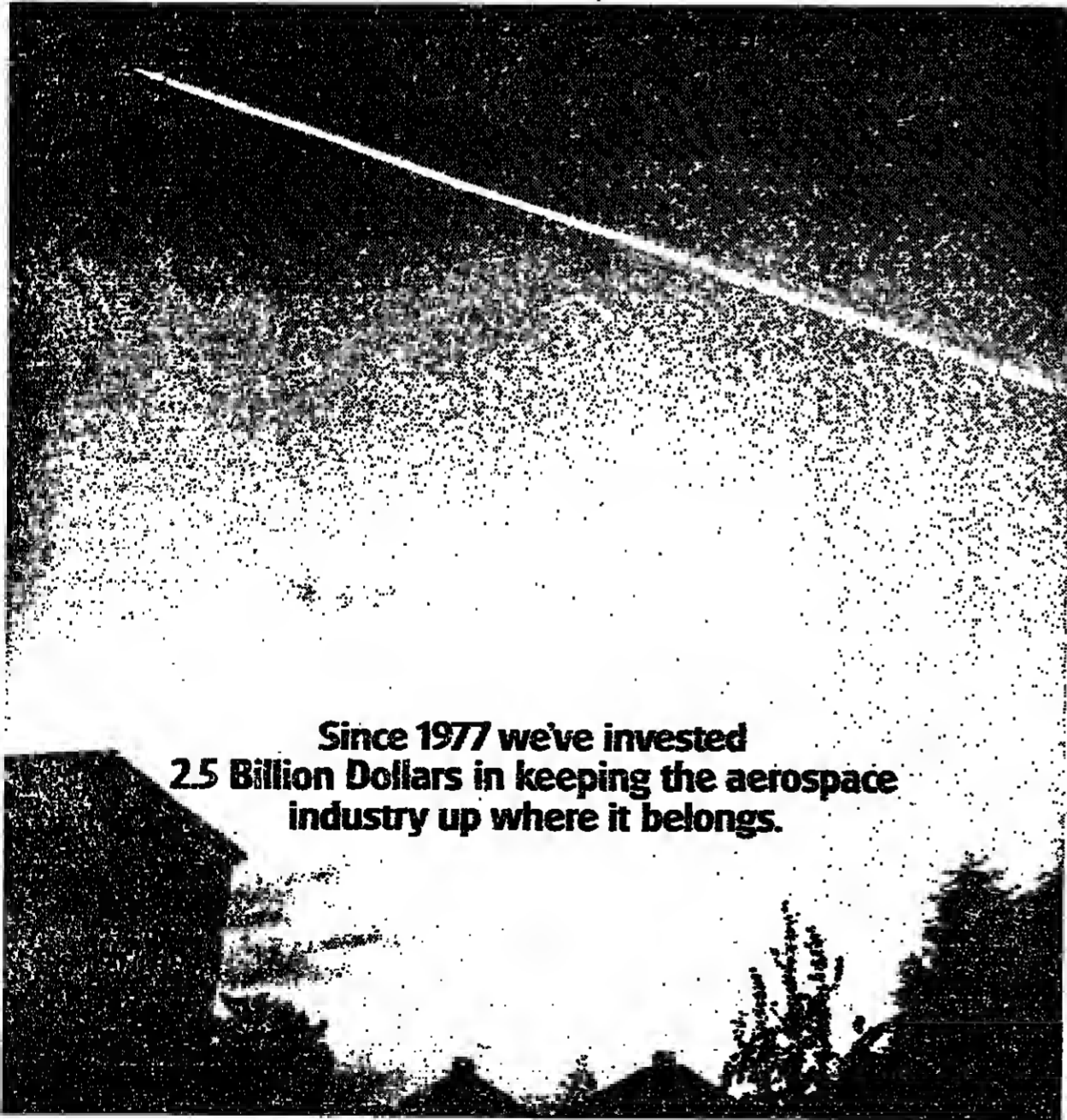
This type of concern has contributed to the decline in sales of light, general aviation and business aircraft in the US and has helped to depress total sales of commuter and business aircraft from \$2.1bn in 1981 to \$1.9bn in 1984. Domestic US sales suffered a decrease of 77 per cent in volume and 83 per cent in dollar value over the period.

Lynton McLain



Left: Interior of a British Aerospace 125 Series 800 twin-engine executive jet, the latest version of this highly-successful aircraft, capable of non-stop flights of 3,000 miles. Above: the Jetstream 31, the company's commuter airliner which has also made its mark.

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35,000	17.50	218.75
50,000	25.00	312.00
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Aerospace 9

New Techniques

Revolution in technology

AS THE costs and complexity of modern military and commercial aircraft, guided weapons and space hardware continue to increase, the aerospace industry, for many years a pioneer of new techniques of manufacture and of new materials, is stepping up its own efforts to generate and exploit further technological advances. And it is encouraging its suppliers in many other industries to do the same.

In military aircraft, the requirement is for more efficient, lighter, faster, more agile, stronger and cheaper aircraft than in the past, and this requires more complex manufacturing techniques.

The prime requirement in commercial aircraft, apart from strength and safety, is for reductions in weight to save fuel costs, bring down operating costs for the airlines—savings which can be passed on in lower fares and rates to passengers and cargo shippers.

In guided weapons, meticulous precision in performance at very high speeds is essential; while in space hardware, whether satellites or manned spacecraft, durability of performance in an exceptionally alien environment is paramount.

The demands that all these requirements place upon materials, systems and structures are exceptionally severe, and throughout the world the aerospace industry is continually seeking improvements in all fields to keep costs within acceptable limits for the ultimate customers, whether governments, air forces or airlines.

Other requirements are also becoming more stringent. Manufacturing times must be reduced, not only to help keep costs down but also to ensure that an individual company's or country's products are not overtaken by competitors.

At the same time, the changing environment in which many aircraft and spacecraft are being required to operate—such as at greater altitudes and at greater speeds—is also leading to refinements in aerodynamic design.

The demand for a "common" wing for the next two European Airbus models, for example, the A-330 and A-340, one a twin-engine and the other a four-engine aircraft, is already stretching the aerodynamic design talents of British Aerospace, despite the fact that it is already one of the greatest airliner wing specialists in the world.

In other areas also, major advances are being sought and achieved. The need for greater agility in combat aircraft has already led to the development of new systems of in-flight control, such as "fly-by-wire", where electronic signals control the manoeuvrability of the aircraft, and this is leading on to the use of fibre-optics, or "fly-by-light".

British Aerospace has done much work in these fields, especially with the "fly-by-wire" Jaguar demonstrator, with the result that the current Experimental Aircraft Programme (EAP) uses this system and it will be incorporated into the forthcoming Eurofighter itself.

The use of computer-aided design and manufacturing (CAD/CAM), largely pioneered in the aerospace industry but now widely used throughout general manufacturing industry, is still one of the basic tools of aircraft design, development and manufacture. But in many companies on both sides of the Atlantic it has been, and is being, carried to new heights of refinement.

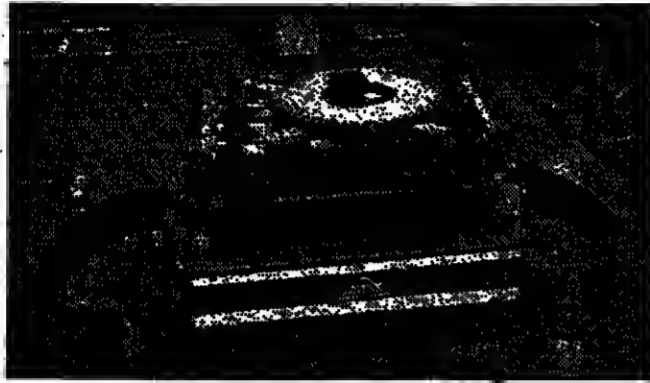
For example, at British Aerospace, it is being applied to the design and manufacture of jigs and fixtures required in the manufacture of detailed airframe components. At the same time, more extensive use of robotics is being made.

British Aerospace's military aircraft division at Warton, Lancashire, has also pioneered the development of what is called the "flexible manufacturing system" involving the complete automation of small parts manufacture from the receipt of the raw materials through to the finalised component ready for assembly on an aircraft, with the minimum amount of operator intervention.

Using numerically-controlled machines under computer control, this system is generating savings of up to 80 per cent in manufacturing time, while cost, work in progress, and scrap are reduced by 70 per cent, and the cost of stock by 80 per cent. BAE's Warton factory is now one of the largest numerically-controlled manufacturing plants in Europe.

At British Aerospace, extensive use of new materials has also been progressively exploited to reduce manufacturing times and costs, especially in advanced military aircraft where more complex shapes are required than on aircraft of the past. In fact, activities have been particularly applied to the £180m Experimental Aircraft Programme (EAP), which is a technology demonstrator for the forthcoming Eurofighter, and will also be applied to the latter aircraft.

Extensive use is made of carbon fibre composites, which offer a reduction of 30 per cent in manufacturing cost because material on the latest engines, giving considerable weight reduction in the number



Automatically-guided vehicle carries a turbine disc in one of Rolls-Royce's Derby factories. Rolls-Royce has introduced an extensive integrated manufacturing system (AIMS) to automate and cut the costs of manufacture

of detailed parts, along with increased strength-to-weight ratios, a reduction in waste materials and easier production of large, complex, curved shapes.

Work is also being carried out in BAE on super-plastic forming and diffusion-bonding techniques which appear to be well suited to the use of titanium, enabling this strong, lightweight metal to be formed into complex shapes. Such techniques are used in production of wing components for the A-330 Airbus, offering dramatic weight-saving benefits, and will also be used on new generations of advanced military aircraft.

Super-plasticity is a phenomenon which occurs in a number of metals which have a suitable micro-structure (certain alloys of aluminium, titanium and steel) whereby at temperatures of about 50 per cent of melting point, the metal assumes a so-called "super-plastic condition."

In this state, and under load, the metal will deform at near constant stress to give the complex shapes required in aircraft manufacture.

In addition to weight savings and a higher level of damage tolerance, such parts can be reduced in number, while also allowing for reduced assembly and fabrication time, thus resulting in lower manufacturing costs.

Diffusion-bonding, in simple terms, is where a number of suitable pieces of metal are pressed together at a critical temperature, the change in the grain structure causing atomic diffusion across the joint line. The resulting structure becomes a single piece of metal—the joint line disappears.

At present, for aircraft design purposes, this process is applied to titanium alloys, with resulting structures that are competitive in terms of both cost and weight, with carbon fibre composites and conventional aluminium alloy designs.

At Rolls-Royce, considerable attention is paid to what the company calls "the management of technology." This involves keeping under review all the economic and competitive factors which affect the future of its business.

Advanced technology and demonstrator programmes are undertaken so that Rolls-Royce can keep its options open and make the most of business opportunities offered by new engines and developments of current ones when they arise.

Research and technology demonstrator programmes prove the effectiveness and practicability of technical advances at relatively low cost before they are applied to an engine which will go into development, production and service.

This ensures that technology for new engines is proven in advance. This "up-front" expenditure on technology has reduced overall engineering costs by up to 60 per cent.

Specific recent developments in new technology by Rolls-Royce include advances in engine turbine blade manufacture, whereby the crystal line grain structure of blades is controlled while they are being cast. This has led to directionally solidified (DS) and single-crystal (SC) turbine blades.

DS blades are cooled in such a way that the molten metal solidifies as crystals stretching the length of the blade—giving greater strength in this direction to carry its high centrifugal loads. These blades are more reliable and have a longer service life than those with a crystal structure providing the same strength in all directions.

SC blades are cast in a manner similar to the DS process, but arranged for the whole blade to solidify as a single crystal of high-strength metal.

Rolls-Royce has assigned advanced computer-controlled facilities for the manufacture of DS and SC blades which are unique to the company. It is also a leader in non-destructive testing and techniques for checking whether the crystal axes within SC blades are correctly aligned to provide the required strength characteristics.

Other advances being studied include new techniques for the manufacture of engine components including those based on powder metallurgy. Ceramics, too, have long offered the promise of being an effective high-temperature material for turbines if adverse factors such as their brittleness

savings over the steel retention rings used on earlier high-bypass turbo-fan engines.

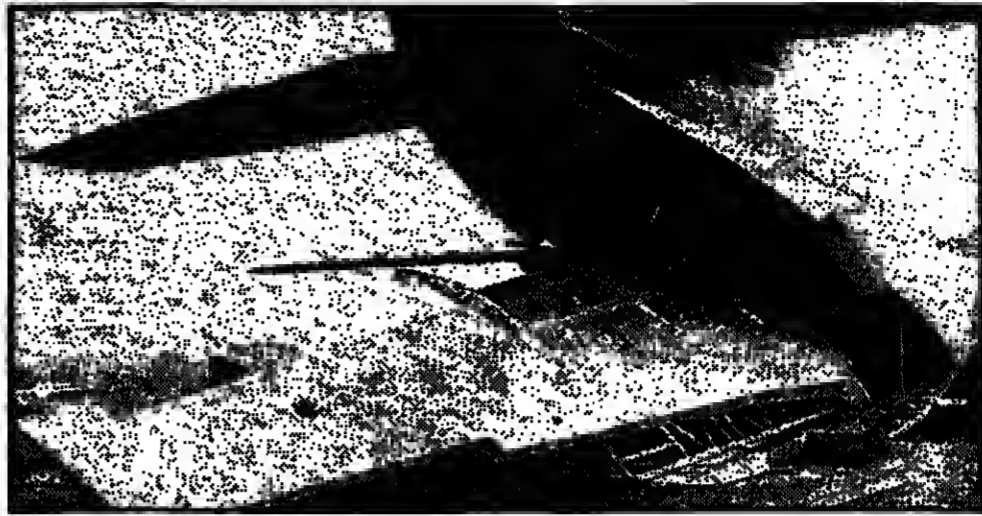
Rolls-Royce has pioneered in many other advances in aero-engine development, including the application of computers to a wide range of research, design and manufacture, together with the construction of major new advanced test facilities such as new test facility at Hucknall, an advanced compressor test facility at Derby and a turbine test facility at Bristol.

The company has built a new gearbox test rig for work on the forthcoming generation of prop-fan engines.

The introduction of advanced machining centres and robot handling has made it possible to produce engine parts faster, more efficiently and more economically and to reduce the large inventories of work in progress that were typical of engine manufacture in the past.

There are many other new techniques of manufacture, and new materials, now moving into aerospace. The advanced technological revolution has effectively only just begun, and over the next few years it can be expected to accelerate, as the requirements of civil and military aviation themselves become more stringent and complex.

Michael Donne



Wings built by Short Brothers of Belfast for the Dutch Fokker 100 jet airliner are loaded into a giant freighter of Heavy Lift Cargo Airlines for shipment to Amsterdam

Air cargo

Fall in tonnage carried

ALTHOUGH WORLD air freight activity showed a significant improvement during the 1982-1984 period following the airline recession of the early 1980s, culminating in a 9 per cent growth in the tonnage carried in 1984, last year there was a small decline, to 13.2m freight tonnes carried.

This fall is attributed to the slowing down in the rate of

recovery from the recession in some of the Western world's major economies during 1985, which has apparently also continued into the early months of 1986, especially on the North Atlantic route.

Figures issued by the British Airports Authority (now BAA plc) for the first six months of 1986, for example, indicate

that the tonnage of cargo handled by its seven airports (including Heathrow and Gatwick) remained virtually static at 740,550 metric tonnes.

This situation is widely regarded in the air transport industry as temporary. At the current level of more than 13m freight-tonnes, air cargo is still at its highest ever, reflecting

the increasing interest being shown in freight as a potential contributor to revenues and profits among most of the major airlines in the Western world.

In many airlines, vigorous efforts are being maintained to overcome current problems and ensure a resumption of growth in the years ahead. There is fierce competition not only between airlines and freight forwarders but also between individual airports, to win the business that is available and promote further expansion.

In the UK, these efforts are being spearheaded by BAA plc through its Lodon Air Cargo Promotion Group (called the Task Force) which brings together all elements of the air cargo industry to promote the concept of the UK, and the London area in particular, as a major air cargo centre.

The Task Force's "Gateway London" message has been carried to many parts of the world, and last May the sales promotion drive was taken to the Far East, via Tokyo and Osaka.

The efforts of the Task Force in 1985-86 resulted in London overtaking Paris to take second place (after Frankfurt) in the European air cargo league—the first significant change since 1981-82.

BAA plc points out that the opportunities for London to recapture lost traffic and to gain new business remain "very good" but it adds that industry-wide consultation and co-operation "must be supported and strengthened if London is to regain its position as the premier European cargo gateway to the world."

MD

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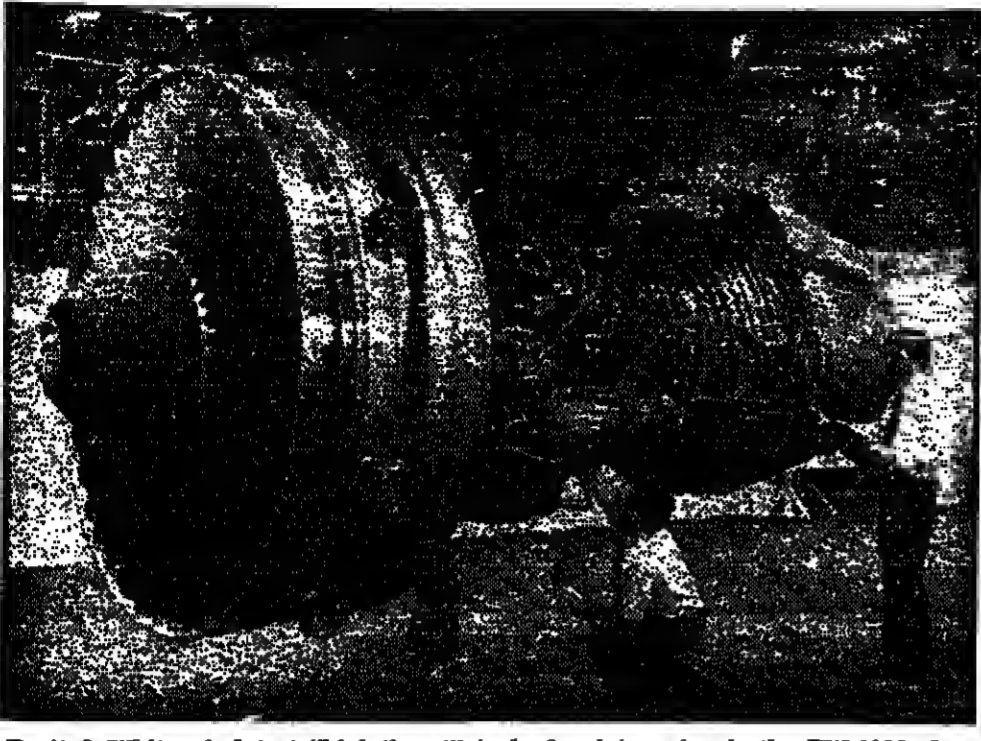
Dassault International chalet 1 - 4 row C / stand NE 5-2

Business takes off with Falcon

Aerospace 10

Engines

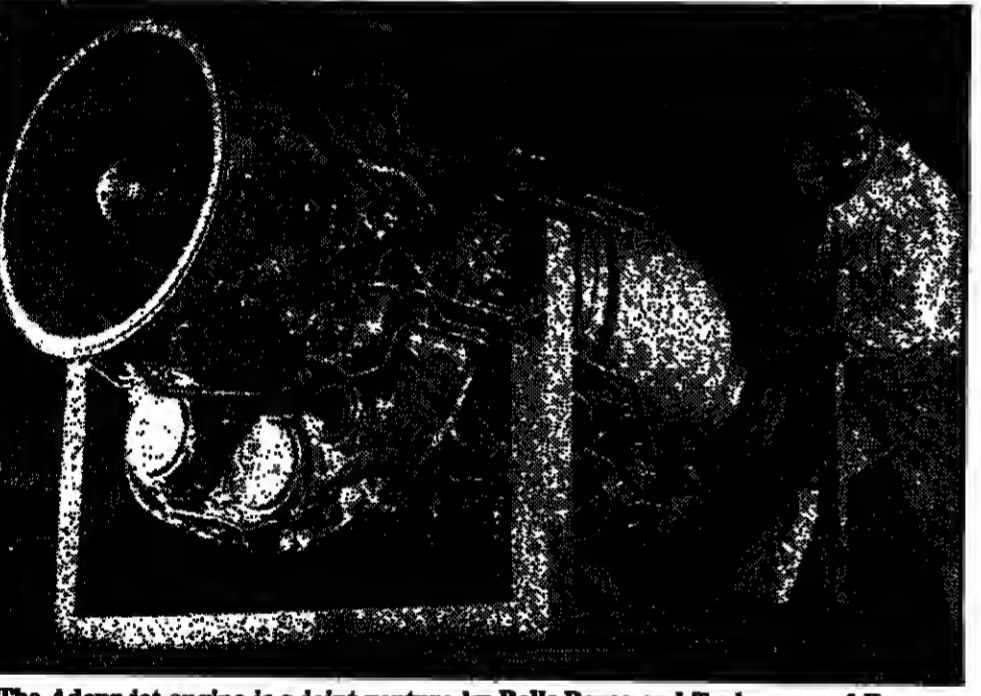
Waiting for the prop-fan era



Pratt & Whitney's latest "high-thrust" turbo-fan jet engine is the PW4000, for Boeing 747 Jumbo jets, tri-jets and wide-bodied Airbus aircraft



The Rolls-Royce Pegasus 406 is the latest production version of the vectored-thrust jet engine used in the advanced British Aerospace-McDonnell Douglas AV-8B Harrier II fighter for the US Marine Corps



The Adour jet engine is a joint venture by Rolls-Royce and Turbomeca of France, for the Jaguar jet fighter and the Hawk fighter and trainer aircraft

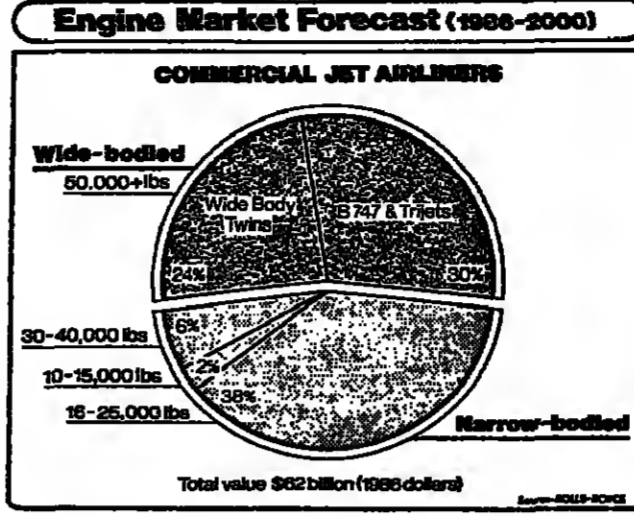
ALTHOUGH THE world's major aero-engine manufacturers continue to spend considerable sums on the development of turbo-fan (jet) and turbo-propeller engines of all kinds, in the certainty that these types of power-plant will remain in airline service well into the next century, an increasing volume of investment is now being devoted to a new development—the prop-fan engine.

Various claims have been made for this type of propulsion that it can offer reductions of up to 40 per cent in fuel consumption compared with current generation turbo-fan engines, or 25 per cent better than the new generation turbo-fans now under development, together with less noise and pollution, while also yielding aircraft speeds equivalent to those provided by jet engines themselves.

Such claims, to be proved, however, but if they can be justified, the prop-fan engine will clearly be a formidable competitor to conventional turbo-fan and turbo-propeller propulsion. Already extensive prop-fan research is being undertaken by all the major engine manufacturers, and interest in the concept is widening.

Fundamentally, the prop-fan is a derivative of the already well understood concept of harnessing a propeller to a gas-turbine engine to provide turbo-propeller power. The differences lie in the design and number of propeller blades—usually up to 16, mounted in two sets of eight on two counter-rotating hubs, and designed rather like scimitars or ships' screws instead of the conventional propellers of today.

Also, the design of the gas turbine engines themselves has been improved to give substantially greater efficiency. The combination of these developments generates the savings and other benefits claimed for the prop-fan.

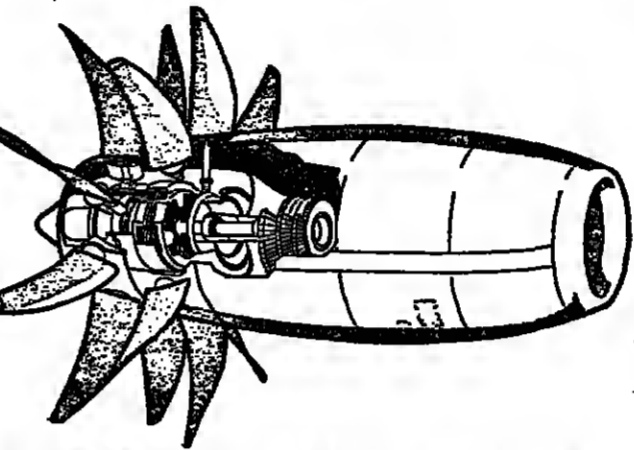


The Competition in Aero-engines

Engine Thrust	Pratt and Whitney	General Electric	Rolls-Royce
50,000+ lbs	JTD PW4000	CF6-80/80A CF6-80C2	584
35-40,000 lbs	PW2037		585E4
16-25,000 lbs	JT8D V2600	CFM56	V2500
10-15,000 lbs	JT8D		TAY

Rolls-Royce and General Electric collaboration on CF6-80C2 and RB-211-535E4, in competition with Pratt and Whitney.

Pratt and Whitney & Rolls-Royce compete with JT8D and Tay.



A prop-fan engine. The gas-turbine "core" (right) generates the power to turn the counter-rotating hubs (left) on which are mounted several propeller blades, shaped rather like ships' screws. These blades can be "open," as shown, or "ducted," surrounded by a nacelle

mine the most popular interior layouts for their prospective airliners.

But there is still much to do. Noise levels, vibration, and safety issues such as blade security, have all to be satisfactorily settled before the aircraft can be accepted for service, in addition to confirming the fuel consumption claims.

Also, there are differing views on the merits of different designs—such as the Allison/Pratt engine against gearless engines (as in the GE prop-fan).

But GE itself appears to have no doubts. It says that its engine, which it calls an "Unducted Fan" or UDF (others call their prop-fans "Ultra High-Bypass" or UHB engines and there are already many variations on the trade names involved), is already a reality.

"When GE announced its intention of building a counter-rotating UDF engine with world-beating fuel efficiency, the industry had doubts," says the company. It has been done. The proof-of-concept engine began ground testing in August, 1985. It set and holds the world's record Specific Fuel Consumption for turbo-fan engines, of at least 500 aircraft of the 70-90 pound of thrust. The UDF proof-of-concept engine has already achieved 25,000 lbs of thrust.

smaller 150-seater airliners, but also "ducted rotors," which are larger engines with shrouds or nacelles round the propellers. This makes them suitable for under-wing installation on bigger aircraft such as the Boeing 747 Jumbo jet.

Rolls-Royce is committing considerable technical resources to this work, which is aimed at the possible start of full-scale production in the 1990s. The research has included the construction of a new test facility for gearboxes transmitting up to 15,000 hp—such gearboxes being likely in its view for future prop-fan engines.

While recognizing that there will be substantial interest in the prop-fan engine in the smaller aircraft, such as the 150-seater 737 and 190-seater MD-91X in the early 1990s, Rolls-Royce believes that the biggest market, in terms of value, will emerge in the larger aircraft of over 200 seats for medium to long ranges, such as new-generation tri-jets or Jumbo jets, in the mid-to-late 1990s.

Much of Rolls-Royce's prop-fan work is thus currently being directed towards engines for the bigger aircraft, with studies on what the company calls a "contra-fan" engine, which might be suitable for new versions of the Boeing 747, such as the Series 500, for very long ranges in the mid to late 1990s.

Already its studies have indicated that it would be possible to develop an engine of reduced length and weight compared with original design ideas.

Interest in the prop-fan is now growing rapidly and the concept is in fact now developing a momentum of its own.

In West Germany, Messerschmitt-Bölkow-Blohm has signed an agreement with Catic, the import-export agency of the Chinese Ministry of Aviation, to co-operate on development of a 75-passenger counter-size prop-fan transport, the MPC-75. A feasibility study is to be completed by mid-1987, and the partners will then decide whether the market would support full-scale development.

MBB's current view is that it will with an estimated sale of at least 500 aircraft of the 70-90 passenger size by the year 2004, with up to 250 in China itself.

MBB has also signed an agreement with General Electric of the US, which is already working on the prop-fan for the bigger Boeing 737 150-seater, for development of a smaller engine for the MPC-75.

The next step will be for the company to design a full-scale contra-rotating gearbox that could be tested in 1988-89, and a prototype engine could run by 1990 with service entry in the mid-1990s.

However, the company is also working with airframe manufacturers such as Boeing on the production of a gearless contra-fan for under-wing mounting on wide-bodied aircraft, such as Jumbo jets, an arena which it believes potentially represents over 50 per cent of power-plant demand to the year 2000.

Space

Western confidence takes a knock

THE STEADY progress towards increased commercialisation of space ventures in the West has come to an abrupt halt with the series of rocket accidents which has crippled its satellite launching industry. It has cast a pall, at least temporarily, over ambitious plans in the US and Western Europe for a manned space station in the 1990s.

Meanwhile, the focus of international attention in space activities has shifted eastwards. The Soviet Union has already launched about 40 satellites this year, has sent into the heavens a new improved space station, and in what amounts to a series of space-age taxi rides, has ferried cosmonauts between this and an earlier station already in orbit.

In July, two Soviet space men, Vladimir Soloyov and Leonid Kizim, completed a four-month stint shuttling between the two stations.

The spotlight has turned, too, on the space activities of China and Japan. China is offering launch services to the West with its Long March 3 rocket—these vehicles or previous generations have lifted into space about 20 satellites, all of them Chinese—while Japan is quietly developing the foundations for an impressive space programme of its own, including even a Japanese version of the space shuttle.

Overshadowing the West's space industry is January's disastrous explosion of Challenger killing seven astronauts.

Challenger was one of the US National Aeronautics and Space Administration's fleet of four Space Shuttles. Pending design changes to the faulty rocket boosters, which were the cause of the explosion, the remaining three Shuttles will not fly again before 1988.

Flights of Ariane, Western Europe's satellite launcher which is operated by Ariane space, a company based near Paris, are also suspended following a worrying run of accidents involving the vehicle's third-stage engine. Unlike the other shuttles, which return to Earth after space missions, Ariane is a conventional expendable rocket, which, in the process of taking payloads into orbit, is destroyed like a giant firework.

The flight of the 19th Ariane rocket—in launches of the previous 18 vehicles, problems have occurred on five occasions which have led to the loss of at least one satellite—will probably not now take place until the spring of next year.

These problems would be less important but for the decision made by NASA some years ago to concentrate on the Shuttle for launchers, leading to the stopping of production of the Delta and Atlas-Centaur expendable rockets which have successfully delivered objects into space for more than two decades.

Over the next two years, governments and companies had planned the launch of about 30 commercial communications satellites in either Ariane or the Space Shuttle.

Following the rocket failures, these organisations have received major setbacks. Most of them are resigned to long postponements—and some may abandon their satellite ventures altogether.

The implications of the delays are widespread. A case in point is the launch of TV-broadcasting satellites, which are supposed to be using in a new era of TV with programmes beamed directly from orbit to rooftop dish aerials. Big plans by France and West

Germany for such ventures have been put back owing to the problems with Ariane.

In Britain, meanwhile, the Independent Broadcasting Authority is asking companies to submit their bids to run a UK TV satellite later in the decade, with a government decision on the issue due next year. But companies are likely to think twice about putting in a submission when they realise that launching the satellite will be extremely unlikely in this period because of the queue building up for Ariane and the Space Shuttle.

Besides holding up satellite schemes for TV broadcasting and telecommunications, the launch hiatus may also affect replacement of the ageing satellites currently in orbit for jobs such as monitoring the weather or taking high-resolution pictures of the Earth's surface.

According to space analysts, the Chinese, Japanese and Soviet rockets to which the West could turn for launches are unlikely to provide a solution. These are unlikely to take into orbit more than a handful of Western satellites over the next decade—the Chinese and Japanese rockets are relatively unproven while sending sophisticated satellites to the Soviet Union for lift-off poses security problems for many Western governments.

Ambitious plans to bring into the space business companies from outside the aerospace industry have also been affected. There had been suggestions that by the end of the century manufacturing companies—for instance in chemicals or metals production—could be using space platforms to create new types of

materials in the exotic conditions of weightlessness or vacuum. Such forecasts look more than a little optimistic today.

A question mark also hangs over the US effort to lead a consortium of Western nations in building in the 1990s an international space station. Besides Western Europe, Canada and Japan are due to be the other partners in the venture, which is meant to provide orbiting workshops for experiments in areas such as materials science together with a space outpost for trips further into the solar system, and for satellite repairs.

The shuttle explosion has grievously damaged confidence in this kind of venture. Mere to the point, some of the \$8bn which NASA had earmarked for the plan (the other countries had been due to contribute a further \$4bn or so) may now be required to fund a replacement vehicle for Challenger, the cost of which would be about \$2.5bn.

NASA suffered a severe public relations blow with the Challenger accident and the US Congress is unlikely to be as generous in financing the agency's schemes as in the past.

The US Government now has to decide whether to scale down the space station venture—which could mean the production of a relatively simple station instead of the large and sophisticated base that was planned. This could entail dropping ideas to involve the other nations—or put back the launch perhaps until after the year 2000.

Were it not for two factors—strong lobbying by the US aerospace industry and the high public profile of the successful Soviet programme in space

stations—President Reagan might already have felt compelled to cancel the space station altogether.

The lobbying efforts are trying to ensure that the station scheme is kept going to provide work for aerospace companies. If plans for the station were discarded, the industry would have little option but to disband teams built up since the early 1960s to work on manned space programmes.

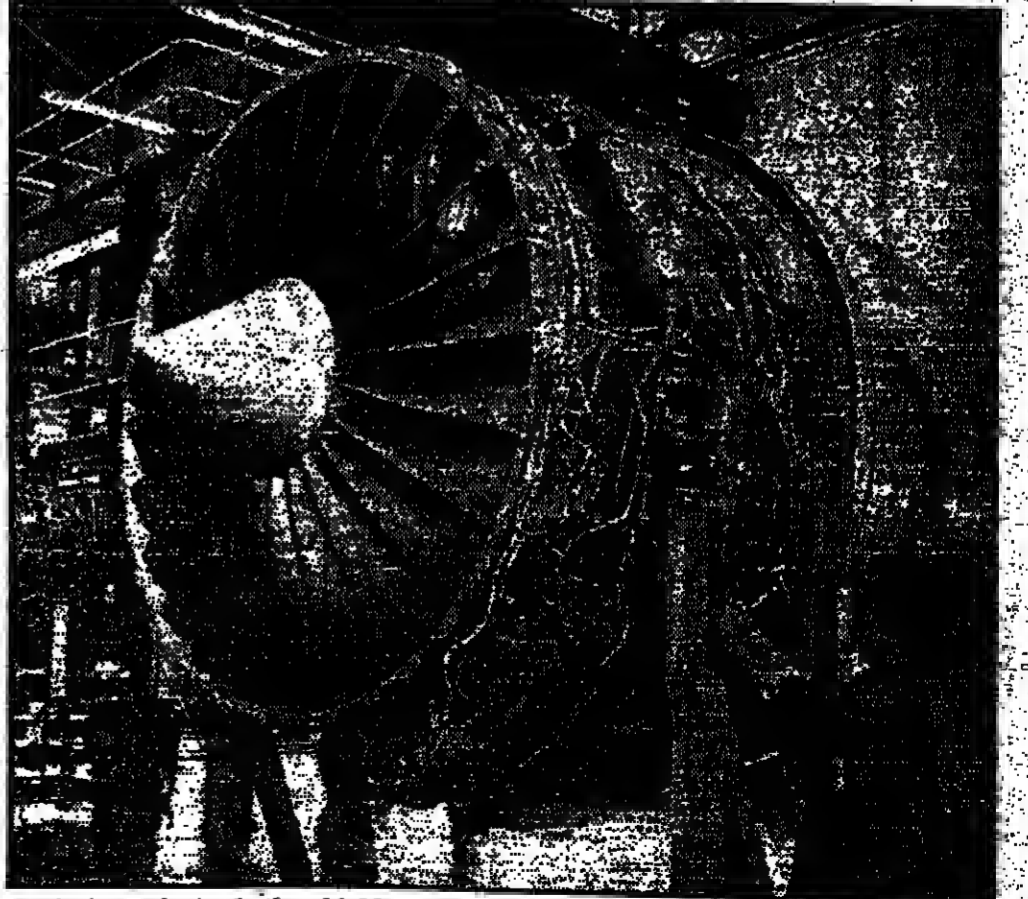
National prestige, meanwhile, will see to it that so long as the Soviet Union keeps up its space station plans, the US will be forced to do something similar. The lead by the USSR in this area is already worrying many in the US.

The Soviet Union has launched a total of seven manned Salyut stations, one of which is in orbit and was joined in February by the first of a new generation called Mir. Inside these capsules, people have lived and worked for up to eight months at a time, conducting a variety of scientific experiments and learning the rudiments of space habitation.

It appears likely that the Soviet Union has its eyes on a manned trip to Mars, perhaps some time soon after 2000. Such a venture would be a huge boost—and would cancel out America's success in 1969 in reaching to the Moon first.

The desire to match its superpower rival in extraterrestrial ventures will continue to be a powerful driving force in the US space programme—and will ensure that the country cannot simply pull out of or scale back space plans even when financial and industrial logic suggest that it should.


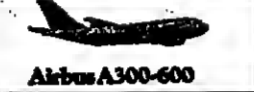
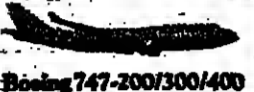
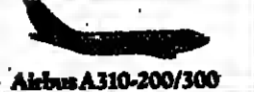


Michael Donne



Latest version of the highly-successful Rolls-Royce RB-211 engine is the 524D4D of about 58,000 lbs take-off thrust, already ordered by Cathay Pacific Airways, and now also ordered by British Airways for the Boeing 747 Series 400 Jumbo jet

Peter Marsh

CF6-80C2 THE ANSWER TO TOUGH, NEW REALITIES.

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USA

The UK

Testing time for decisions

THE UK aerospace industry is heading for another record year for turnover, exports and a positive contribution to the UK's balance of overseas trade.

At the same time, however, it is awaiting some major government decisions on new ventures—such as the Eurofighter; funding for new versions of the European Airbus; and future space development plans—as well as decisions on the privatisation of Rolls-Royce and Short Brothers.

All of these will have far-reaching implications for the industry's future workload, export performance and profitability through to the end of the century.

Annual turnover of the UK industry in 1985 amounted to well over £7bn, compared with close to £2bn in 1975. Over the same decade, the industry's exports rose from £750m to £4.2bn.

Today, the industry exports nearly 60 per cent of its turnover, or about 8 per cent of the UK's total manufactured exports, and in 1985, the industry made a positive contribution to the balance of payments of over £1bn.

Overall, the UK aerospace industry employs over 200,000 personnel directly, including some 35,000 in the electronics industry, with another 250,000 employed indirectly on aerospace work in other industries—such as metallurgy, chemicals, ceramics, glass, and hydraulics. Few industries, in fact, do not have some relationship, however remote, with aerospace.

Over the past decade, according to figures prepared by the Society of British Aerospace Companies, the aerospace industry has exported over £22.5bn worth of its products, which in terms of 1985 pounds is worth £11bn. Over this period, the industry's contribution to the positive trade balance is £5.3bn, or in 1985 currency in excess of £5.5bn.

With the Western world's aerospace export market through to the year 2000 estimated to be worth over \$1,400bn (over £920bn), the UK industry is looking forward to capturing a substantial slice of that trade across the entire spectrum of civil and military aircraft, guided weapons and space hardware.

While much of that future success depends on the wide

range of products already in production or under development, an equally significant part of the industry's future depends upon new products and programmes now in the preparatory stage.

At the same time, much depends upon the freedom of the industry to conduct its commercial affairs in the way that it sees fit, which is why the privatisation of Rolls-Royce and Short Brothers are regarded by many in the industry as imperative for the future.

British Aerospace, after its full privatisation, some time ago, has forged ahead, and it is hoped that similarly both Rolls-Royce and Short Brothers will be able to do the same.

Recently, in a message to staff, Sir Francis Tombs, chairman of Rolls-Royce, said that he expected Rolls-Royce would

skilled and responsible workforce, and this, together with the other strengths, would make it possible for the company "to return to the private sector with confidence and to use the opportunities of that move to consolidate our progress."

The company's sales in 1985 are expected to rise to £1.5bn, some £200m higher than in 1985, with a further rise forecast for 1987.

No decision on a date for the privatisation of Short Brothers of Belfast has yet been taken, although the Government has stated positively that it is on its list for eventual return to the private sector.

The company has been under Government ownership since it was taken over in 1943 during the Second World War. Since then it has had a chequered financial history, but has expanded considerably indus-

ing ALF-502Rs for Bae 146s, and for the International Aero-Engines IAE V-2500 for the Airbus A-320.

In military aviation, there is the prospect of some slow-down in the tempo of existing activity, as a result of cuts in the overall defence budget (1.5 per cent annually over the next three years) that may force the Government to spread out some programmes over longer periods of time than originally planned and reduce others.

Already, the Secretary for Defence, Mr George Younger, has indicated that some Harrier, GR Mark 5 jump-jet fighters may be cut from orders already announced, and that its introduction into RAF service may be delayed.

Overall, the message coming from the Commons defence debate earlier this summer was that major new ventures will be strictly reviewed as to both timing and funding.

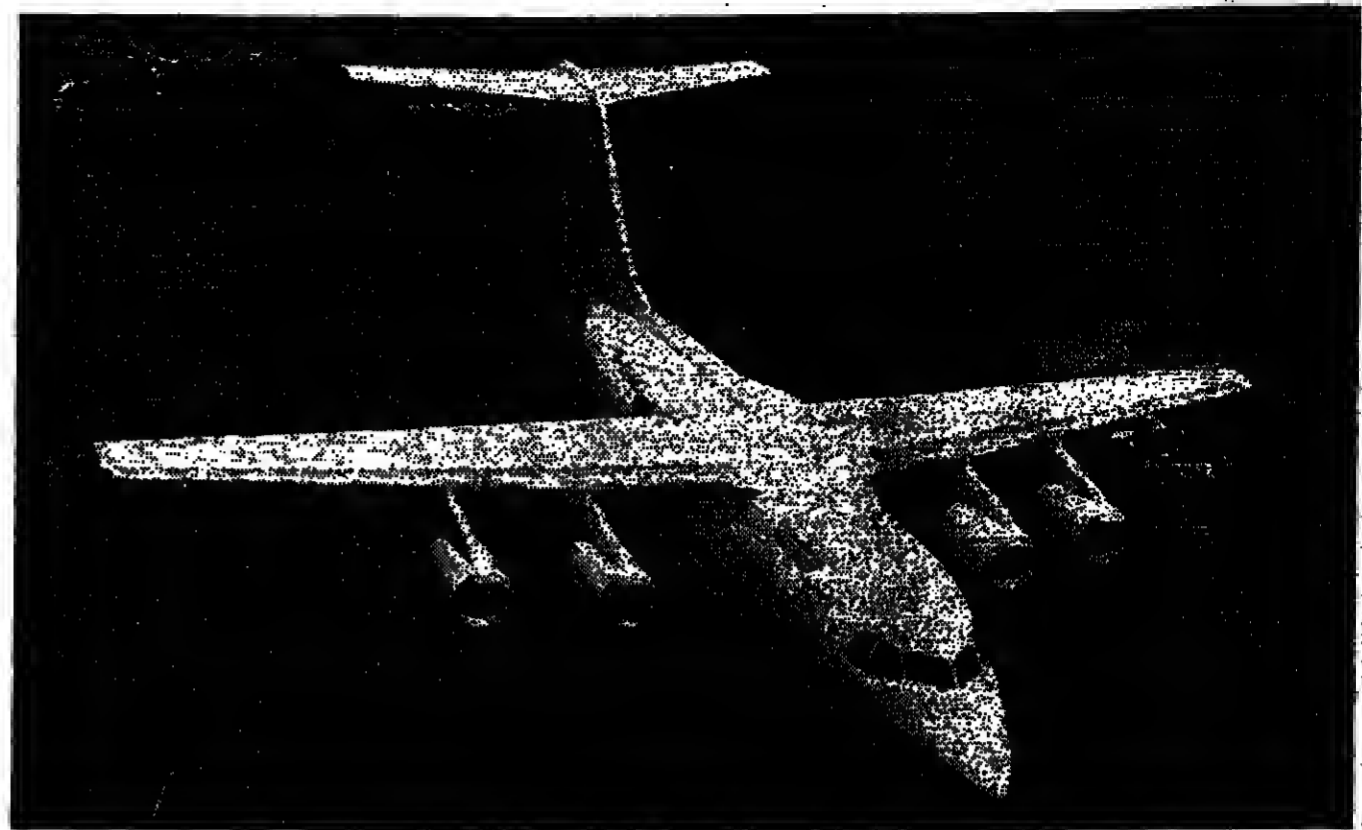
This situation may affect some current programmes, in addition to the GR Mark 5 Harriers, but there is no indication yet that it will affect the projected four-nation Eurofighter, now moving towards a critical go-ahead decision.

The Eurofighter is essential, not only to the RAF as a replacement for Jaguar strike aircraft and ageing Phantom and Lightning jets, but also to the UK military aircraft manufacturing sector which is now over the peak of production of Tornado multi-role combat aircraft.

Production of the latter has been extended as a result of additional orders recently from West Germany for an air reconnaissance version and from Saudi Arabia and Oman, but even so manufacture is due to end in the early 1990s, unless even further orders are won overseas (and strong efforts continue, especially for example in Indonesia and Turkey).

By that time, the production of the Eurofighter, of which the UK is expected to take about 260, will be getting into its stride, ensuring continuity of workload and employment.

Work on the project definition phase of the Eurofighter is now close to completion (target date is September), and the industries of the countries involved (UK, West Germany, Italy and



The British Aerospace private-venture four-engined Type 146 regional jet airliner, which is selling well, especially in the US

Last year the industry made a positive contribution of £1bn to the balance of payments

be privatised by next June.

"By then we shall have established a reliable track record of profitability and we will, I am confident, be in an internationally competitive position, capable of convincing investors that Rolls-Royce is the company they should invest in."

The 1984 profit of £28m before tax had been more than tripled in 1985 to £81m. "Now I know that sounds a lot of money, but it really is not enough for us to be making in what was quite a good trading year. To secure our future we need to achieve something like double that figure," Sir Francis said.

But he claimed Rolls-Royce was now in "quite a strong position," with the workforce reductions that had already taken place, the wider range of engines, the solid technology base, and the substantial investments which had been, and continued to be, made in new machine tools and computers.

Above all the company had a

trially.

Today, it has a flourishing business in three broad areas. One is the manufacture of civil and military aircraft, including the civil 330 and 360 twin turboprop commercial transports, and now also the Brazilian-designed Tucano basic trainer for the RAF.

In guided weapons, the company makes the Seacat ship-to-air weapon, the Blowpipe and Javelin man-portable anti-aircraft missiles and now also the new Starstreak high-velocity air defence weapon, selected by the British Army.

In aerostructures, the company undertakes the design and manufacture of parts for a wide variety of overseas aircraft, such as the Boeing 747 Jumbo jet, 757 and 737-300 jets, and wings for the Fokker F-28 and now also the new Fokker F-100 twin-jet.

It also undertakes extensive jet engine nacelle "podding" work on the Rolls-Royce RB-211 engines for the Boeing 747 and 737 airliners, the Avco Lycom-

Spain) will then submit the project for approval by their governments, with a view to subsequent launching of full development as soon as possible.

As discussed elsewhere in this survey, the programme envisages over 600 aircraft for the four countries, with eight prototypes built to flight test the entire aircraft as a weapons system, and to enable production aircraft to enter service with the air forces involved in 1995.

The cost will be substantial, perhaps as much as £20bn, spread over the four nations, and the workload will keep the military side of the UK aerospace and associated industries (such as electronics) busy for many years, probably well into the next century.

In commercial aviation, the UK industry remains active in the manufacture of wings for the existing range of European Airbus and manufacture of complete aircraft such as the Bae 146 regional jet airliner, the Advanced Turbo-prop, the Jetstream 31 turbo-prop, the 125 series of executive jets and the Shorts 330 and 380 twin turbo-prop airliners.

British Aerospace, however, is also anxious to participate in the next generation of Airbus

now being planned—the medium-range, high-density, twin-engined A-330 and the four-engined, long-range A-340.

Airbus Industrie, in which BAE is a 20 per cent shareholder on behalf of the Government, is now planning to develop these for service in the early 1990s, with a formal launch expected around the turn of this year, depending on the inflow of launch orders.

Airbus plans to build the two aircraft with many common parts, including wings and fuselages, to keep down development costs but, even so, the overall cost has been set at not less than \$2.5bn and it may be considerably more.

This money must come from the partner companies, and so BAE itself expects to have to subscribe perhaps as much as £500m for its share of the work—principally the wings for the two aircraft, the area in which it is now one of the world's experts.

BAE's problem is that its own cash resources are already heavily committed to other civil aircraft programmes so that much, if not all, of its contribution to the A-330/A-340 programme will have to be subscribed by the Government as launching aid.

Informal discussions have been held with the Department of Trade and Industry, the view in Whitehall is that BAE cannot expect to receive the full sum required, and even then will have to make a first-class case for such support at it gets, in view of the Government's own desire to keep down public spending and a more critical approach towards launching aid for various aerospace ventures in view of past losses in that field.

It seems likely that BAE will have to seek some alternative sources of finance to top up whatever balance is needed to enable it to participate in the A-330/A-340 venture. The prospect otherwise is that BAE will have no part in that venture, and thus while continuing with its existing Airbus work, will be out of the further expansion of that organisation.

What does not seem to be in doubt is that even if BAE cannot gain a share in the A-330/A-340, those aircraft will be developed, one way or another, with other manufacturers already standing on the sidelines.

ready to pick up the lucrative wing business if BAE itself is not able to undertake it. Were that to happen, a major workload for the UK industry could be lost through the 1990s and beyond.

In space, Mr Roy Gibson, director general of the British National Space Centre, has now presented to the Department of Trade and Industry his National Space Plan. This involves a series of options, or "menus" from which the UK Government can choose, with the highest cost being given to the development of the Hotel trans-atmospheric vehicle, discussed elsewhere in this survey.

A wide range of options is involved, however, including whether or not the UK supports financially the development of the French-inspired Hermes manned spacecraft, how much the UK spends on development of its share of the Columbus (Europe's share of the US manned space station), and in the Ariane heavy rocket launcher.

The Government is likely to study the plan carefully, and it could result in doubling the UK's space budget from £100m a year at present, in the 1990s.

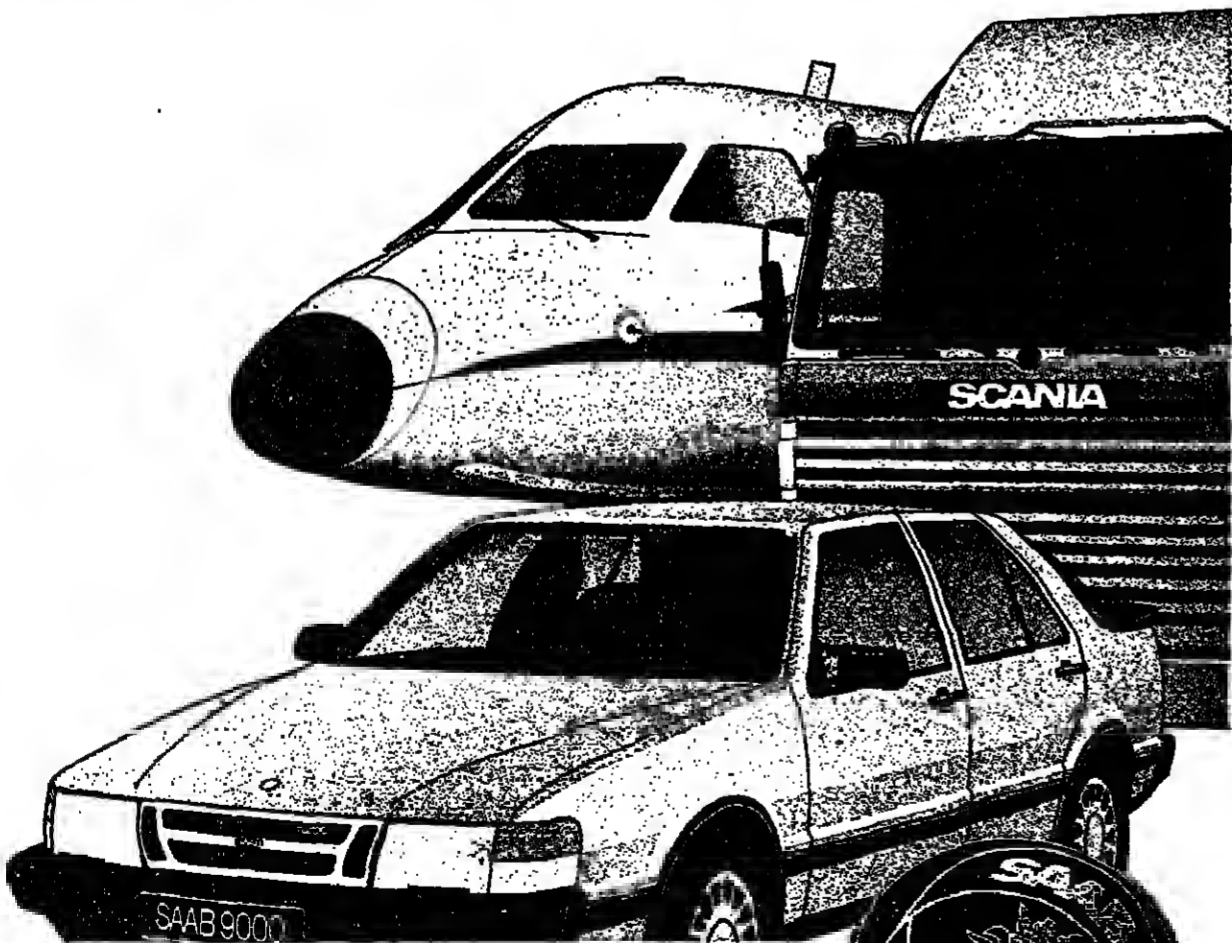
Michael Donne

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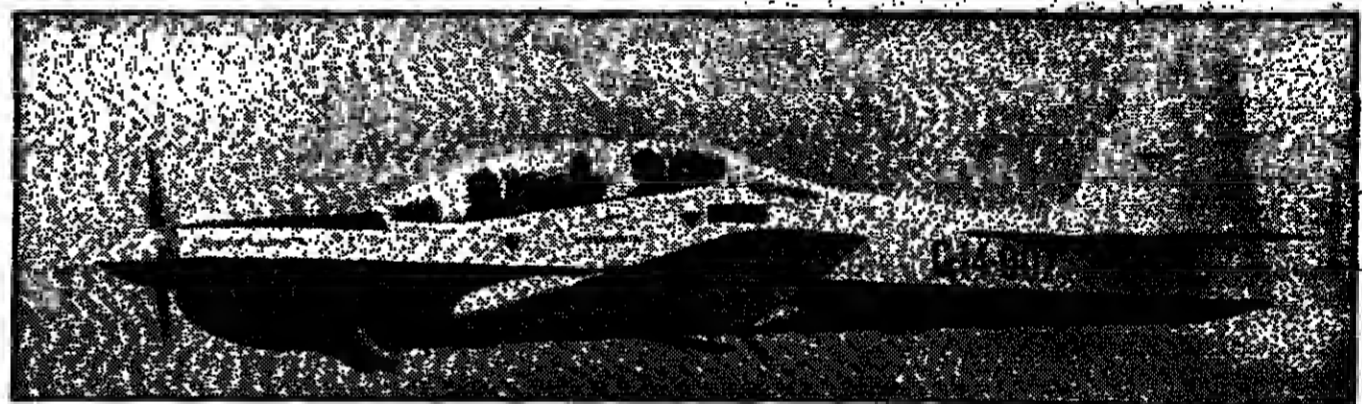
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The Brazilian Embraer Tucano basic trainer is now being built in quantity by Short Brothers for the RAF

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The US

Sharp variations in earnings

AEROSPACE manufacturing in the US has become increasingly polarised in the past decade or so, divided between the very few companies which still have a part to play in the commercial airliner sector and those which are connected with the defence or space business.

Growth in the two areas tends not to run in tandem, and the differences in the cyclical behaviour of the two industries have begun to show up, particularly in recent months.

In the commercial airliner business, 1986 looks already as though it will be an outstanding year, with both orders and production up on the healthy figures generated in 1985 as the world's airlines moved into a period of extensive aircraft replacement.

The benefits of this boom, however, are spread very thinly in terms of airline manufacturers and are concentrated on the two big US companies which remain in large-scale manufacturing—Boeing and McDonnell Douglas. Between them, these two companies announced a total of 507 airliner orders last year.

The pronounced cyclical swings of commercial airliner production are amply illustrated in Boeing's financial performance over the last five years. The Seattle-based group plummeted from peak earnings of \$400m in 1980 to a low of \$28m in 1982, and back up to \$268m last year.

That figure looks set to be easily exceeded this year, when the group achieved net income of \$517m in the first six months against \$246m in the same period of last year.

These sharp variations in earnings, along with the economies of large-scale production, which demand hefty

capital commitments and tight managerial controls, have forced most of Boeing's early rivals out of the business. Even McDonnell Douglas has only a limited range to offer—essentially the MD-80 twin-engine 150-seater—leaving Boeing as the only producer in the world offering a variety of

Airbus consortium in a deal aimed at mounting a concerted attack on Boeing's pre-eminent position.

Boeing itself, despite its enormous financial strength—\$3.5bn cash available at the end of June—is also moving in the direction of joint ventures, partly in an effort to

years ago. But it will put pressures on margins—a point which was evident in the first-quarter figures from some of the big military suppliers.

Additionally, several of these companies are having to trim back prices because of the Pentagon's recent accusations of inflated billing on some contracts, and they stand to lose from the proposed new tax Bill going through Congress.

The rundown of military contracts may be one of the reasons why several companies appear intent on diversifying either outside or inside the defence sector. McDonnell Douglas, for example, bought Hughes Helicopter two years ago; and General Dynamics, having swallowed Chrysler's tank business in 1982, acquired Cessna, the light aircraft manufacturer, last year.

More recently, Lockheed, which in the last decade has turned itself from a civil aircraft group into a pure defence and space company, has acquired Sanders Associates, a high-technology electronic warfare company. Analysts believe this will allow Lockheed to build up a military electronics business that will enable it to offer complete weapons systems to the Pentagon.

The third main sector of US aircraft manufacturing—general aviation—has been in decline since the 1982 recession and seems stuck in the doldrums for the time being. These small and executive aircraft manufacturers have suffered from the cutbacks in corporate overhead spending, while their own costs have been hit by increased insurance premiums against product liability.

Last year the general aviation specialists—Beech, Fairchild Aircraft, Gates Learjet,

An outstanding year is expected for airliner production but defence orders are now falling

products from the 100-seater 737 to the Jumbo 747, capable of taking up to 550 passengers. Boeing recently added to its potential range by acquiring De Havilland, the Canadian manufacturer of short take-off and landing and other commuter aircraft, a deal which will add a number of short-haul, propeller-driven aircraft to its present range.

Some analysts now question whether McDonnell Douglas will remain indefinitely in the airliner business, at least as a totally independent manufacturer. The St. Louis company already has about 70 per cent of its sales tied up in military and government contracts, has had trouble selling the concept of its planned new MD-11, a 300-seat derivative of the DC-10, and has been diversifying recently with acquisitions in the information systems sector.

One way of competing with its larger rival would be through joint ventures, and there have been strong suggestions that the company might get together with the European

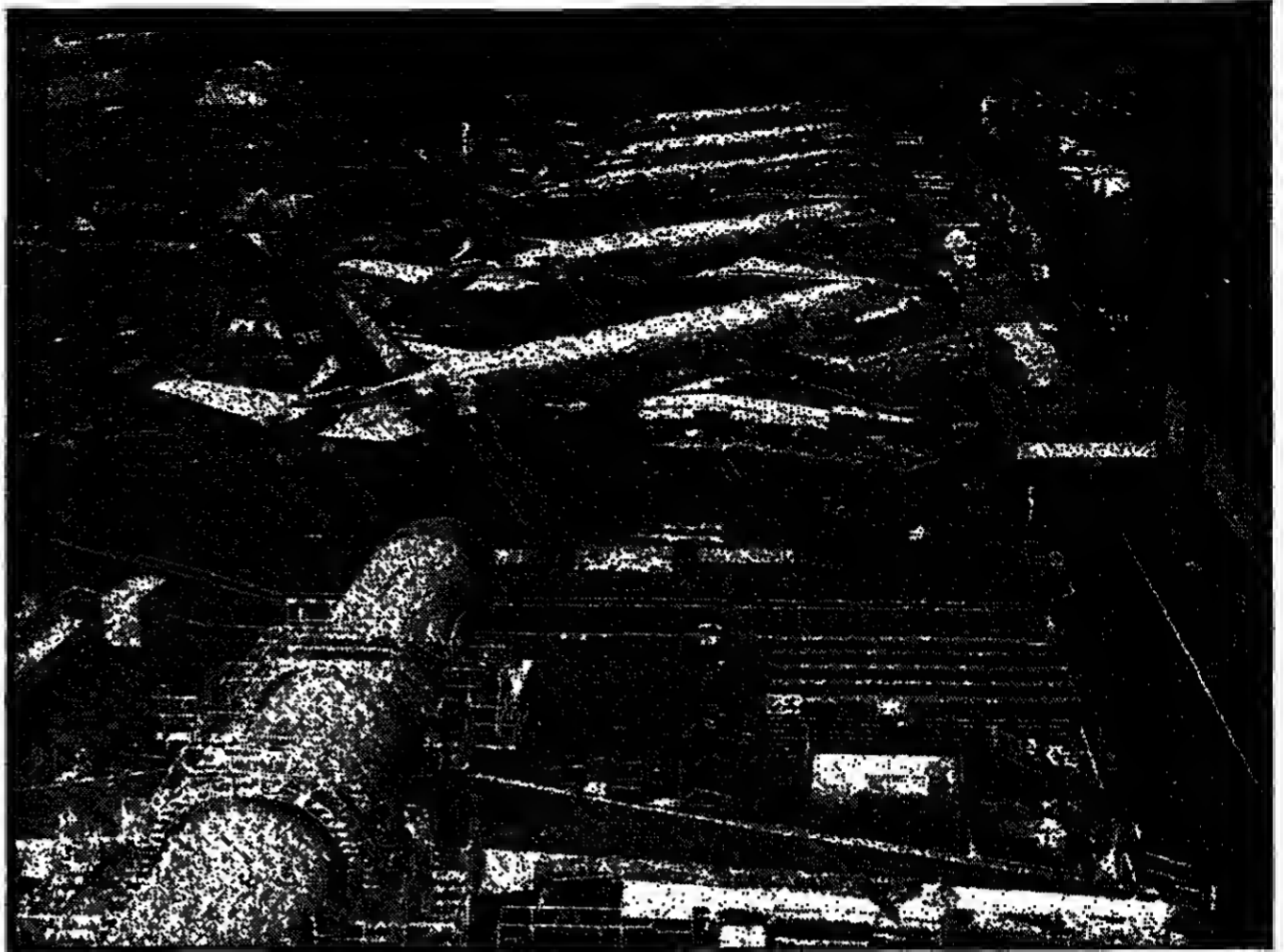
harness additional resources for the next generation of sophisticated and costly airliners now being plotted in the design studios.

A Japanese group has recently signed a contract to take part in the development of the 747, Boeing's planned new 150-seater prop-fan aircraft, which could cost up to \$8bn to bring to production.

In the defence sector, the aerospace companies are now unquestionably moving into a period of declining orders after the exceptional boom that started with the defence build-up in the later years of President Carter's administration and that was given a further boost by President Reagan.

In the 1986 fiscal year, the defence budget has been trimmed from \$314bn to \$296bn in 1986, and Congress seems determined to support a further decline in authorised spending in fiscal 1987.

This will not spell poverty for the military contractors since defence spending is still considerably higher than a few



Final assembly line of the Boeing 757 twin-engine short to medium haul jet airliner at the company's Renton, Seattle, factory

Guilstream, Cessna and Piper—delivered just over 2,000 aircraft, the lowest figure in 40 years, and in the first four months of this year they suffered further setbacks.

The value of orders in this period fell by almost 50 per cent from the 1985 figure, while deliveries were down more than 90 per cent, according to Wall Street estimates.

Several of these companies are owned by larger corporations capable of absorbing the

financial downsizing. But significant questions have emerged over the future of Gates Learjet and Fairchild, both of which have been in loss recently.

Fairchild's problems led it to withdraw from a joint airliner development programme with Saab-Scania of Sweden earlier this year, and it is now pinning its hopes on the T-46 trainer that it is developing for the Government, but which has not yet received final approval.

Gates Learjet has suffered particularly heavily from the collapse of the executive jet market, and is now diversifying as a contractor to the space programme and the military.

Although the troubles of general aviation are not expected to go away soon and the military business is not quite what it has been, the US aerospace sector continues to be one of the bright spots in the economy. It is the country's most successful exporting indus-

try, accounting for \$18.8bn of overseas sales in 1985, against only \$5.6bn of imports. Total sales are now approaching \$100bn, and in recent years it has been an important job creator, increasing employment from 69,000 in 1984 to 75,800 last year. In the current year, the US Department of Commerce expects the industry to grow at an inflation-adjusted rate of 4 per cent.

Terry Dodsworth



LEFT: The Lockheed-California Company's P-3 Orion modified for Airborne Early Warning and Control (AWACS) missions has been offered to the UK Ministry of Defence as an alternative to the Nimrod programme. The P-3 is currently operated as a maritime patrol aircraft by 10 nations including the US. Right: The Pitts series of single-seat biplanes, built by Christen Industries of Wyoming, has been used extensively for aerobatics for some years. The picture shows a Pitts S-2S as used by the British team in the recent Volkswagen World Aerobatics Championships in the UK.

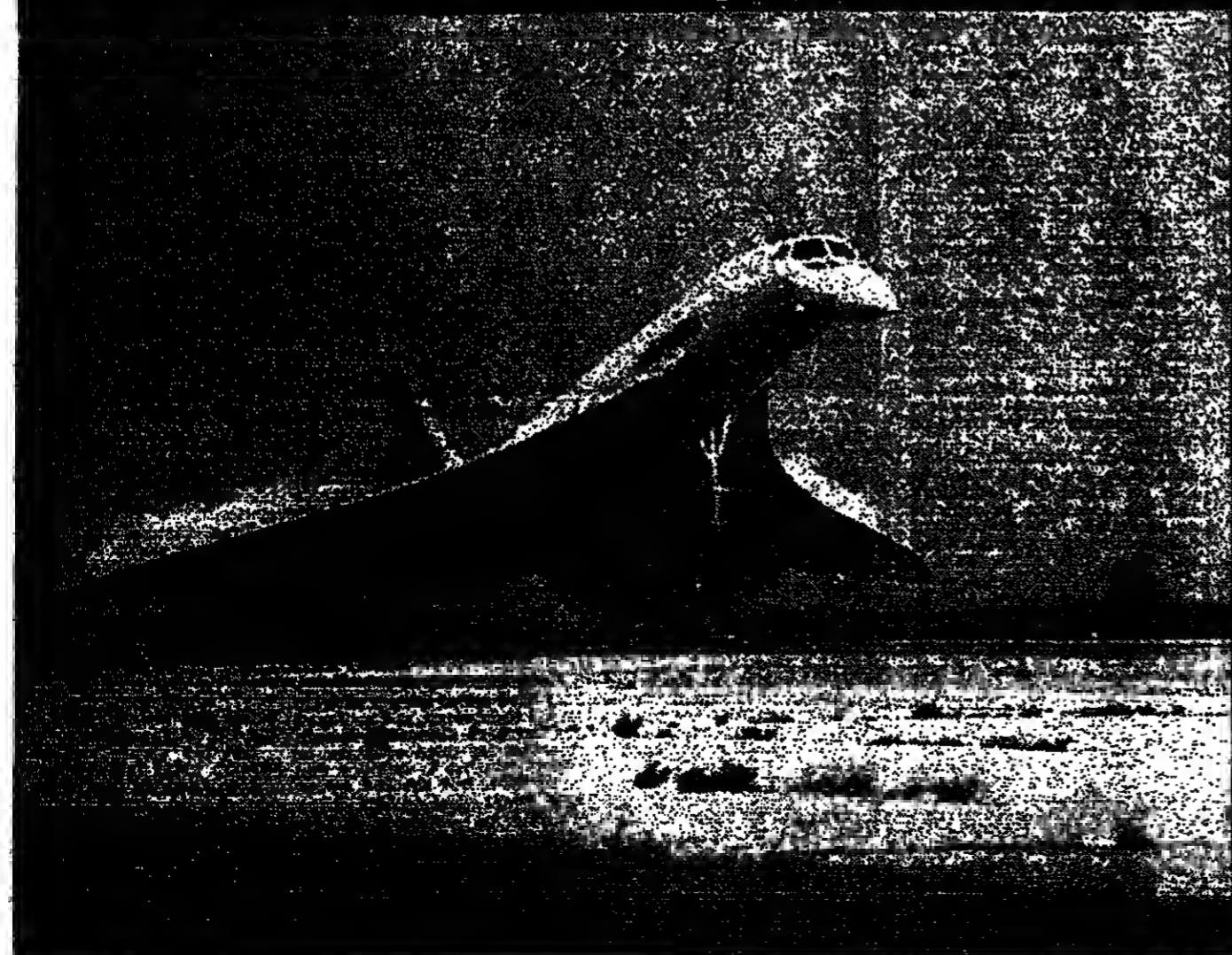


US aerospace companies—1985 results

	1985 sales (\$m)	1984 sales (\$m)	% change on year	1985 earnings (\$m)	1984 earnings (\$m)	% change on year	1985 total backlog (\$bn)	1984 total backlog (\$bn)	1985 funded backlog (\$bn)	1984 funded backlog (\$bn)
Boeing	12,630.0	11,120.0	+13.5	568.0	390.0	+45.1	26.7	24.7	24.7	21.5
McDonnell Douglas	11,472.7	9,582.6	+18.5	345.7	325.3	+6.3	23.9	16.8	22.5	15.0
Lockheed	9,535.0	8,113.0	+18.0	401.0	344.0	+17.0	17.9	9.0	23.9	9.4
Northrop	5,856.0	3,637.2	+57.0	214.4	166.3	+23.5	n.a.	4.6	n.a.	2.4
Grumman	3,098.9	2,603.6	+19.0	81.5	108.4	-24.8	5.4	n.a.	5.1	n.a.

Research: Riva Nachema.

10 years old, and still 20 years ahead



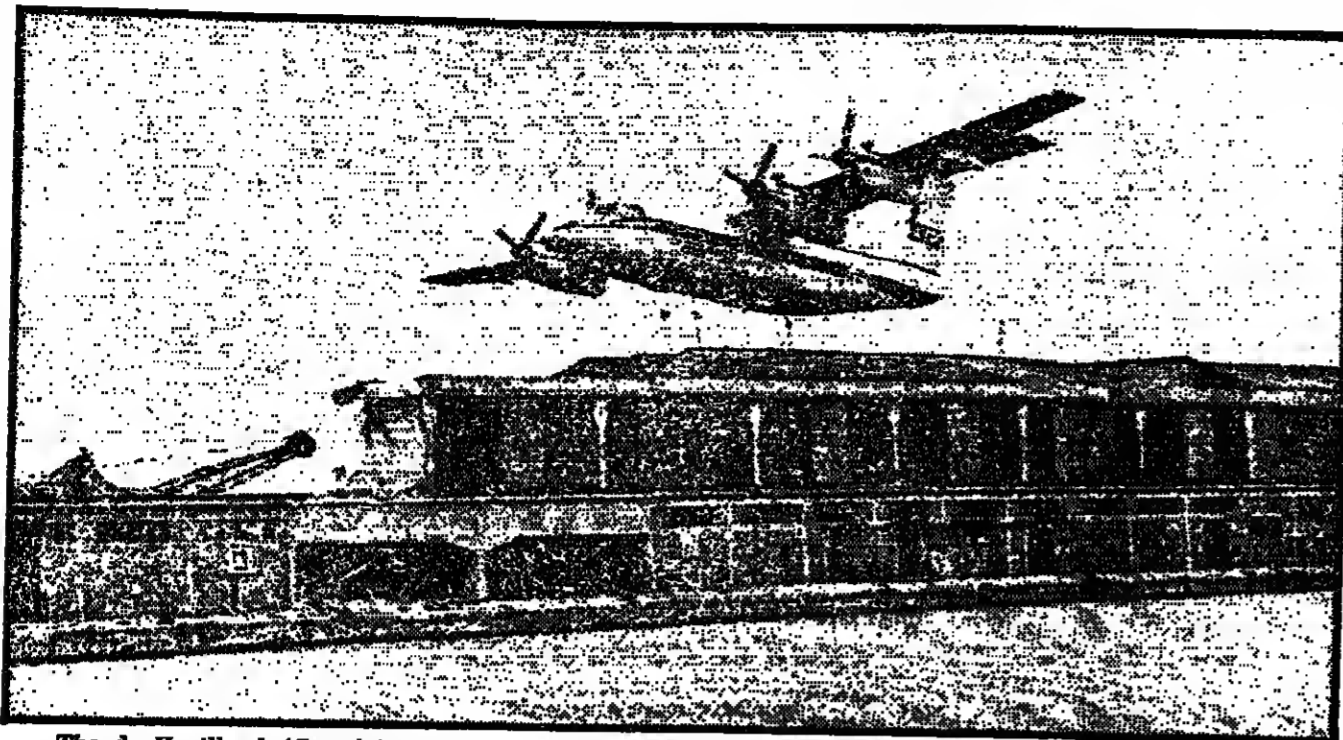
At Aerospatiale, addressing the exciting aerospace challenges of tomorrow means capitalizing on the daring and innovative technologies we pioneered with Concorde. Projects like Hermes, for example. When it enters service in 1995 Europe's Spaceplane will be the direct beneficiary of more than three decades of commitment to advanced aeronautical research and design. Not to mention Concorde's outstanding track record of in-flight performance and reliability. But at Aerospatiale, continually means looking further than just a decade ahead. That's why we're hard at work on Concorde's successor—a hypersonic transport that will dramatically change the way people travel, as early as the year 2000.

*In cooperation with British Aerospace.

aerospatiale.



Aerospace 14



The de Havilland (Canada) Dash 7 four turbo-prop, short-haul and short take-off/landing airliner

Canada

Continuing role for public purse

THE FEDERAL government's privatisation programme is reshaping important parts of Canada's aerospace industry, but the role of the public purse will continue to be vital for the future.

The industry comprises more than 100 companies, some subsidiaries of international concerns, grouped together in the Aerospace Industries Association of Canada. Sales will be about \$4.5bn in 1986, about 80 per cent for export, and employment more than 46,000. Gradually, these companies are becoming more reliant on defence orders, especially from the US.

The Progressive Conservatives came to power late in 1984 and inherited the problems of the two airframe companies, Canadair in Montreal and de Havilland Canada in Toronto. Both had been taken over by Ottawa to save them from collapse during the 1982-83 recession.

In effect, Ottawa assumed nearly C\$2bn in development costs for Canadair's Challenger executive jet, then having teething problems, and for DHC's Dash-7 and Dash-8 commuter aircraft.

The new government decided to take the privatisation route. First it moved to sell DHC to Boeing in preference to a Canadian consortium. Initial contro-

very has died down as order booklets for the twin-engine Dash-8 have risen and Boeing has moved to speed up development of the stretched Dash-8 to carry more than 50 passengers—creating a more competitive aircraft.

The choice of the buyer for Canadair is near. Industry reports persist that the government will choose Bombardier, the Quebec-based manufacturer of heavy transit equipment, snowmobiles and defence products, over the rival Dornier consortium from West Germany in partnership with Montreal.

Whether Canadair would get a valuable contract for the maintenance of Canada's F-16 fighters is not clear, but the choice of Bombardier would help the government's sagging popularity in Quebec though it may peeve some other parts of the country.

Whoever wins Canadair will require a steady base of defence activity to carry the challenge in the medium term, since the market for high-performance inter-continental jets will remain volatile, and competition from the US and Europe strong.

The government has just accepted a solution for the Bell Textron (Canada) helicopter plant at Mirabel near Montreal, where C\$250m has already been

invested. Because the light-twin helicopter market has remained so sluggish, Bell Textron Canada is moving production of two series of commercial light helicopters from Fort Worth to Montreal, while it continues development work on the Canadian-engined twin 400 model and on the 440-twin which will use large amounts of composite materials.

The first Jetrangers and Longrangers will move out the plant early next year, and it may yet have a role in the C\$2bn Sea King helicopter replacement programme for the coastguard.

Both the federal and Quebec governments will continue to make support payments to complete the Mirabel plant, in parallel with Bell Textron (Canada), but defence orders will be important for its long-term success.

A smaller helicopter plant in Ontario, owned by the West German-controlled MBB Aerospace Canada, and begun after Mirabel, is already in production, handling a C\$23m federal contract.

Broadly, the industry, from airframes to engines and avionics, has made a remarkable comeback from the recession. Its products are broader and productivity is higher. The biggest single unit, Pratt and

Whitney Canada, is shifting gradually towards fully computer-controlled manufacturing.

The company is shifting production of its small fanjet engines to Toronto to make room in Montreal for its PW100 series for commuter aircraft. It maintains Canada's second-largest industrial research operation in Montreal and Toronto.

The industry is roughly divided with half in Quebec and the Maritimes and half in Ontario and the West. McDonnell Douglas Canada in Ontario is busy making wings and other parts for the parent's successful MD90 series, and a host of parts and materials suppliers, engine and avionics producers are gearing up for better times.

The low-level air defence system contract, the Sea King replacement and Canada's space station programme will provide several billion dollars of underpinning in the medium term. But one conspicuous success is the CAE Electronics division of CAE Industries, which has carved itself an enviable niche as one of the world's three makers of simulator equipment for commercial airlines and military use.

Robert Gibbens

Soviet Union

Designs match best in the West

IN SIZE and scope the Soviet aerospace industry clearly matches that of the US, across the whole spectrum of civil and military aircraft engines, guided weapons and spacecraft, as well as in avionics and related industries.

Detailed information is hard to obtain, but it may even exceed the US aerospace industry's output in some areas, such as tactical military combat aircraft, reflecting the greater proportion of Soviet gross national product devoted to military production of all kinds.

This is suggested by statistics prepared by the US Department of Defence, comparing aircraft production in the Soviet Union and Nato countries. They show that in 1984 the Soviet Union produced some 900 fighters and fighter-bombers, against Nato's 525; 300 transport aircraft, against Nato's 250; and some 870 helicopters, against Nato's 270.

The total of Warsaw Pact military aircraft is nearly 13,000, compared with Nato's 11,000. While the number of Warsaw Pact combat aircraft in place in Europe exceeds that of Nato by a substantial margin, Nor is this advantage in numbers due in any way to lower quality in a bid for quantity. Many current Soviet civil and military aircraft designs, as seen at recent Western air displays, are of a high standard of technical excellence.

This is a radical change from the position some years ago when, undeniably, the manufacturing finish on some Soviet aircraft shown in the West was inferior to that of the US and UK aerospace industries.

Clearly, the Soviet Union has paid considerable attention to quality and operational performance, and today its designs match the best available in the West.

This is probably due to two factors: first, the substantial amount of money devoted to defence production in the Soviet Union, and particularly to military aircraft; and second, the massive efforts made to acquire modern Western technology.

In many cases, this is not difficult. Freedom of informa-

tion in the West means that enormous quantities of data about civil and military aircraft is readily available in the technical press; while the big air shows, such as Farnborough, Hanover and Paris, pour out information, especially on civil aircraft, in a manner unknown in the Soviet Union.

While so-called "missions" come to those air shows, and major new Soviet aircraft are occasionally displayed as publicity exercises, the primary purpose is to gather as much information as possible about what is going on in Western aerospace, while offering the minimum information in return.

Where information cannot be obtained in such an open manner, the Soviet Union does not hesitate to use other techniques. The US government, in its most recent analysis, *Soviet Military Power*, states:

"Through both legal and illegal acquisition of modern Western production techniques, the Soviets are establishing more efficient, integrated and technologically advanced capabilities for the production of highly sophisticated weapons."

The same document says that, "throughout the last decade, the Soviet military has absorbed an increasing share of the nation's gross national product, a share now estimated at 15 to 17 per cent." This compares with about 6-7 per cent for the US.

labor force, leaving little or no labour growth for the civilian sector."

Whatever the Soviet methods of acquiring information, the fact remains that the output of its aerospace industry is formidable, in quality as well as quantity. This applies as much to space hardware as it does to civil and military aircraft, engines and guided weapons.

The structure of the industry is different from that of the West, where many individual companies, either state-owned or private, compete for major orders. In the Soviet Union, the industry consists of a number of major "design bureaux," most of which were established by famous designers whose names are perpetuated in the organisations, and which specialise in particular types of aircraft. Competition is kept to a minimum.

These aircraft bureaux, in alphabetical order, are:

Antonov, based at Kiev, was founded by the late Igor Antonov. It is primarily a producer of transport aircraft for civil and military purposes. Some are unique in design, such as the An-72 twin-jet short take-off and landing transport, with engines mounted on top of wings that are set high on the fuselage. The latest Antonov product is the An-124 Condor, a strategic heavy transport that is the heaviest transport aircraft in the world, and which is expected to be seen at Farnborough.

Beriev, founded by the late Georgi Beriev, and based at Taganrog, is primarily a producer of amphibious aircraft.

Kyushin, founded by the late Sergei Kyushin, is also mainly a transport aircraft builder. Its most famous recent products include the IL-86 four-jet wide-bodied transport, of which a longer-range derivative, the IL-88 is under development.

Kamov, originated by the late Nikolai Kamov, is primarily a helicopter producer.

MIG, the famous fighter-producer, was founded by the late Artem Mikoyan and Mikhail Gurevich. Its latest product seen in the west is the MIG-29 Fulcrum fighter.

MI, founded by the late Mikhail Mil, is also a helicopter producer, but is engaged in bigger, heavier ones than receiving nearly all the additions to the machinery sector's Kamov. They include some of

Sukhoi, named after Pavel Sukhoi, is a major fighter builder, whose latest venture is the Su-27 Flanker counter-airfighter.

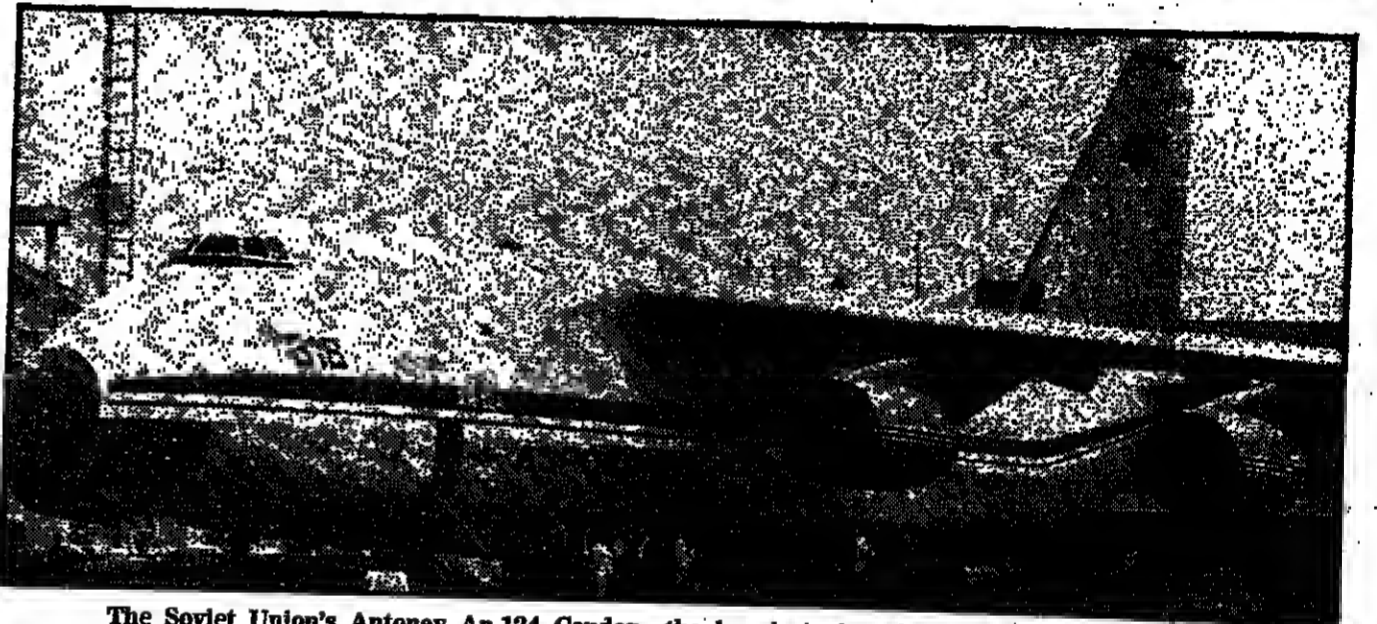
Tupolev, founded by the late Andrei Tupolev, is a major builder of transport aircraft and bombers. Major ventures have included the Soviet rival to the Concorde, the Tu-144, which had only a short period in service. Tupolev's reputation is more securely built on such major airliners as the Tu-154 jet, and on such bombers as the supersonic Blackjack.

Yakovlev was founded by Alexander Yakovlev, who still runs it. Its versatility has produced such aircraft as transport (the Yak-42 tri-jet Globber jet) and on such types like the Yak-38 vertical take-off ship-borne fighter (Forger A); and light aerobatic and sporting aircraft.

Soviet aero-engine capability is also substantial, with such major bureaux as Lotov, Ivchenko, Kuznetsov, Lotarev and Soloviev (although there are others) meeting the entire needs of the aerospace industry.

What is significant about these manufacturers is that they are all substantially self-contained. Unlike the West, where there is a major and growing international trade in aircraft parts and engine equipment, and even in manufacturing collaboration, the Soviet Union buys little from outside, although some procurement from the West is not unknown. This is partly due, however, to the western strategic arms embargo on trade in sensitive technological items to the Soviet Union; although, as already mentioned, the Soviet Union conducted a considerable clandestine business in acquiring western technological know-how.

Michael Donne



The Soviet Union's Antonov An-124 Condor, the heaviest aircraft now flying in the world

Japan

Strong bid for self-sufficiency

JAPAN IS NOT yet known worldwide for its aerospace industry, but it soon will be. The country makes several types of military and civil aircraft and is about to become self-sufficient in communications satellites and the rockets to launch them.

Sales of the aircraft industry reached ¥500bn in 1984 and industry hopes that figure will grow to ¥2,000bn a year by 2000. The industry has grown mainly through licence agreements with US and European airframe and engine makers to make military aircraft and helicopters.

The leading companies, Mitsubishi Heavy Industries (MHI), Kawasaki Heavy Industries (KHI) and Ishikawajima-Harima Heavy Industries (IHI) have also become increasingly important suppliers of components for US airframe makers.

However, Japanese industries as a rule are not content to rely on others for technology and the aerospace industry is no exception. The government has generously supported innovation in this sector and is likely to continue to do so.

Japan's most novel aircraft project to date has been the ¥29bn Asuka fan jet short take-off and landing (Stol) commercial aircraft. The development was started in 1977 by the National Aerospace Laboratory of Science and Technology Agency, and the aircraft, built by KHI, had its maiden flight last October.

Though its total weight is 33 tons, the Asuka can take off and land on a 700-metre runway. The main innovation is the installation of the engines above the wing to generate lifting power two or three times that of conventional jet aircraft. The result is that the Asuka can land or take off at only 180 kph. The Asuka is strictly a re-



The Shin Meiwa US-1 amphibious search and rescue aircraft

search aircraft, but the agency hopes it will lead to commercial development within three years or so. KHI is also the lead contractor for the totally indigenous T-4 jet trainer. More than 200 are to be manufactured for the Defence Agency this year following successful test flights last year.

On the engine side, the main project is the International Aero Engine (IAE) consortium set up six years ago to develop the V2500 engine for short- and medium-range aircraft. Three Japanese companies are participating in the first experimental model of the engine began last December.

Japan launched its first communications satellites in 1983 for use in improving communications with the country's outlying islands. The CS-2 satellites were small (550 kg) but more than half of the technology and hardware was Japanese, with most of the knowhow coming from Nippon Denki, Toshiba and Mitsubishi Electric.

The first 100 per cent Japanese satellite is due to be launched in 1991. Significantly, it will be launched in Japan's first entirely home-made large rocket.

Japan's space agency has long rocket experience going back to 1975 when it launched the small N-1 rocket. This month it was due to launch its H-1 rocket, which is powerful enough to put a 550 kg payload into synchronous earth orbit.

Until now, all Japanese rockets have relied almost entirely on US technology, and so Japan has not been allowed to launch satellites for third countries or export satellite technology and equipment. But the H-2 rocket now under development relies entirely on Japanese technology and is intended to put a 2,000 kg payload into synchronous orbit by 1991.

Despite the recent problems in the US and European space programmes, Japan is pushing ahead with its programme to build a pressurized space

module (JEM). MHI is the coordinator on the ¥240bn project, which will be part of the planned US manned space station.

Even though Japan has a huge trade deficit in the aerospace sector, it is not regarded as a sector in which its technology is superior; and so expects Japan to buy American rather than try to catch up.

Last month Mr Michio Tsutsui, the US Commerce Secretary, complained again that Japan was trying to avoid buying US satellites.

But the main focus of this tension today is the Japanese Agency's desire to replace its ageing fleet of 70 ageing F-15s. The industrial establishment is pushing hard for a decision in favour of the F-16, but the US wants Japan to buy F-16s or F-18s.

Ian Rodger

Great Plane. Great Engines. Great Combination.

The Canadair Challenger 601 with General Electric CF34's

General Electric and Canadair have combined their advanced technologies to produce the most

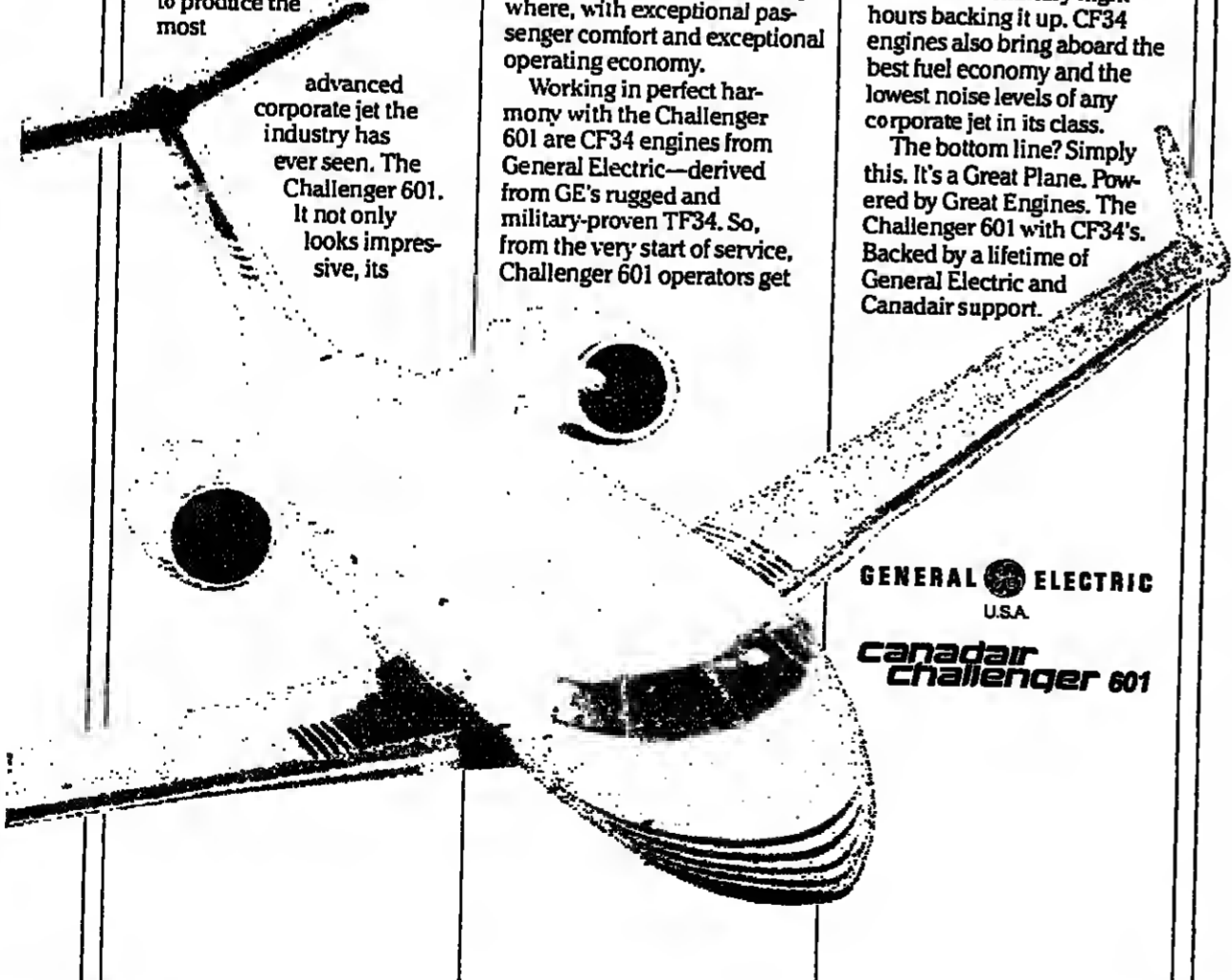
advanced corporate jet the industry has ever seen. The Challenger 601. It not only looks impressive, its

performance is impressive as well. Country-to-country. Continent-to-continent. Everywhere, with exceptional passenger comfort and exceptional operating economy.

Working in perfect harmony with the Challenger 601 are CF34 engines from General Electric—derived from GE's rugged TF34. So, from the very start of service, Challenger 601 operators get

a fully matured, remarkably reliable powerplant, with over four million military flight hours backing it up. CF34 engines also bring aboard the best fuel economy and the lowest noise levels of any corporate jet in its class.

The bottom line? Simply this. It's a Great Plane. Powered by Great Engines. The Challenger 601 with CF34's. Backed by a lifetime of General Electric and Canadair support.



GENERAL ELECTRIC
USA
Canadair
Challenger 601

It's a Great Combination.

Aerospace 15

France

Hard choices on collaboration

THE FRENCH aerospace industry is approaching a crossroads in the sky. The sector, which has long been one of the most dynamic and internationally successful areas of French industry, faces a number of difficult decisions over foreign collaborative projects which could spell make or break for the 1990s.

The industry has managed up to now to balance the alternative challenges of competition and collaboration with a reasonable degree of success.

Aerospatiale, the state-owned aerospace group, has become a pillar of European collaboration. It has forged strong links with Messerschmitt-Bölkow-Blohm of West Germany and with British Aerospace over projects as diverse as the European Airbus and anti-tank missiles. The longer-standing contact with MBB—which goes back to the post-war Franco-German aerospace arms co-operation, at the end of the 1950s, are underlined by the links between the two companies in satellites as well,

whereas British Aerospace's satellite agreements are with Matra.

On the other hand, Dassault-Breguet, the military aircraft maker in which Mr Marcel Dassault, its founder, never loosened control up to his death in April, has provided a counter-example by forging a go-it-alone path.

The Dassault Mirages throughout the 1960s and the 1970s became symbols and sometimes even promotional tools of France's independent foreign policy.

Now, however, faced with increasingly aggressive American competition on world aerospace and defence technology markets, and shrinking budgets among some of France's traditional clients in the Third World, Dassault clearly is having to change course.

Two events illustrate the increasing pressures faced by the French industry. The presence of Chancellor Helmut Kohl at the Hanover air show in June backed up the belief that the German aerospace industry will be trying to take a much larger share of the cake in future Franco-German collaborative projects.

Strong hints have already occurred in recent months as a result of difficulties with the Franco-German project to build a joint attack helicopter for the 1990s, as well as wrangling over the two new Airbus projects—the A330 and A340—currently on the drawing board.

The other event was Dassault's offer at the Jakarta air show a few weeks ago to help construct a mooted fighter to be built by the fledgling Indonesian aerospace industry. The idea of Dassault offering its services as a sub-contractor would have been unthinkable even a few months ago," says a top executive at another big French aerospace group.

Dassault's stubborn refusal to give up its claim to leadership in the long-running negotiations over the European fighter aircraft last year now appears to many in the French industry to have been a mistake.

Dassault is now looking for possible collaborative agreements with northern European countries including Belgium, the Netherlands, Norway and Denmark, which could join in building a developed version of its Rafale prototype which made its maiden flight in July.

Mr Andre Giraud, the French Defence Minister, has rejected the idea, put forward by President Mitterrand last November, that France could take a small stake in the four-nation fighter to be built by Britain, West Germany, Italy and Spain.

This means that the Rafale follow on and the EFA will both be slugging it out on world markets in the 1990s—a prospect which adds to the possibility that Dassault will try to make the planned lighter version of the Rafale as attractive as possible for export customers.

One intriguing idea being examined is that Dassault could go into partnership with a US company such as Northrop for work on a 1990s fighter. A strong example of US-French co-operation has already been set by links between Sncma and General Electric in the aero engine field.

As Paris and Bonn do their best for political reasons to keep tension between their two countries' aerospace industries under control, France might find some logic in seeking greater rapprochement with the US aerospace industry in coming years.

For instance, French officials strongly back Airbus Industrie's contacts with McDonnell Douglas over possible co-operation—although they say there is no question of allowing any delays for the A330 and A340 programmes.



The Saab SF-340 twin turbo-prop regional and commuter airliner is now increasingly used in Western Europe, the US and elsewhere. This line-up of 10 SF-340s shows the Crossair, Switzerland, fleet

Sweden

Shift to civil aircraft building

SWEDEN'S AEROSPACE industry is continuing to shift the emphasis from military to civil aircraft production, but the past year has proved that such a transition is not always easy.

The centrepiece of SAAB-Scania's expansion into the civil sector is the SF-340, a 35-seater twin turbo-prop commuter aircraft, built in collaboration with Fairchild Industries of the US. Work on the joint venture began in 1979 when SAAB saw it was becoming dangerously over-dependent on orders from the Swedish Air Force at a time of rising military R&D and production costs, and contracted defence spending.

When the SF-340 went into production in 1984, it also conveniently covered a hull between the company's production phase-out of the Viggen fighter in the mid-1980s and start-up of the multi-purpose JAS 39 Gripen combat aircraft in the 1990s.

But a major problem appeared last November when Fairchild withdrew from the project, citing economic reasons, leaving SAAB with the burden of manufacturing the aircraft on its own. As a result, SAAB has had to invest an additional SKr 600m, raising its total project cost to SKr 2bn.

Although Fairchild paid SAAB \$25m when it dropped out of the project, this only partially covers the cost for the construction of a new wing factory and other production facilities necessary to complete the project. The new investment puts increased financial pressure on SAAB's flight division, which saw its net income drop from SKr 130m on sales of SKr 1.92bn in 1984 to SKr 106m on sales of SKr 3.2bn in 1985, due to the start-up costs for both the SF-340 and the JAS 39.

It is now expected that SAAB must wait until the 1990s before making a profit on the SF-340. The break-even point, previously estimated at 200 aircraft, is now said to be at least 300.

This is a daunting figure considering that it represents 20 to 35 per cent of the world market for commuter aircraft and that SAAB must compete against the De Havilland Dash 8 and Embraer's Brasilia 120.

SAAB has delivered 61 SF-340s and firm orders take the total to 80. Those in service have been plagued by technical problems centring on the aircraft's General Electric CT7 engine, which have led to several temporary groundings. SAAB says the faults have now been corrected.

SAAB, meanwhile, is broadening its involvement in several international airliner programmes. The company agreed earlier this year to participate in the research phase of the McDonnell Douglas MD-81X prop-fan programme.

It has also joined the team of companies working on the Boeing 777 prop-fan airliner and will provide airframe parts, amounting to a 4 per cent interest in the project.

However, its planned participation in production of the McDonnell Douglas MD-11, for which it was expected to make the tail fin, is now uncertain following the Swedish government's refusal to provide a SKr 400m loan to cover investment costs.

With the SF-340 in full production and the company supplying airframe components for the MD-80 and the BAe 146, SAAB's business is now evenly balanced between the military and civilian sectors, the goal it set for itself at the beginning of the decade when more than 80 per cent of its sales were military-related.

But SAAB's—and Sweden's—single biggest aerospace programme remains the JAS 39, the first flight of which is scheduled for next year. The SKr 400m project calls for 140 aircraft to be produced for the Swedish air force by the end of the century. SAAB is responsible for 60 per cent of the work including airframe construction and systems integration.

Volvo Flygmotor, the aero engine subsidiary of the automotive group, and GE are co-producing the single jet engine based on the F404 and LM

Ericsson is producing the radar, sensor and target acquisition systems as well as the cockpit display.

The programme was threatened last year by a cost overrun due to dollar-denominated foreign contracting which includes GE, Lear Siegler (electrical flight systems) and British Aerospace (development of an all-composite wing). But the steady fall of the dollar against the krona this year has bridged the budget gap temporarily at least.

SAAB is pinning export hopes on the JAS 39 despite the fact that it has not successfully sold any combat aircraft abroad since the 30-year-old Draken. SAAB believes that the JAS 39's combined role as a fighter, ground attack and reconnaissance aircraft together with its easy maintenance—simple enough to be performed by conscripts—will make it ideal for smaller countries.

Volvo Flygmotor has also been increasingly shifting its attention to the civil sector, which now accounts for 40 per cent of sales. It is cooperating with GE, Pratt and Whitney and Garrett on a range of engine programmes for passenger aircraft.

A milestone in the Swedish aerospace industry was marked this year with the launch of the scientific satellite Viking in February, the country's first. SAAB's space subsidiary was the project's prime contractor. Sweden's next space project is the Nordic telecommunication and broadcast satellite Tele-X, scheduled for launch in 1987. SAAB is a subcontractor in the SKr 1.5bn programme with the prime contractor being France's Aerospatiale. Sweden is financing 30 per cent of the Tele-X budget with the rest shared by Norway, Finland and possibly Denmark.

Sweden is also planning to spend SKr 1bn, divided 60/40 between industry and government, on European Space Agency-related activities by 1990, including the Ariane Launcher, the Hermes Space Shuttle and Columbus space station.



The latest venture planned by Europe's Airbus Industrie is to develop in parallel both the A-330 short-haul high-density twin-engine jet and the four-engine long-range A-340, using common wings, fuselage and systems

West Germany

Strategic ventures outside Europe

WEST GERMANY'S leading aerospace concern, Messerschmitt-Bölkow-Blohm (MBB), spreading its wings in recent months, has embarked on two strategic ventures aimed at opening up important new non-European markets.

One big breakthrough came this spring at the Hanover International Air Show, where the group signed an agreement in principle with the People's Republic of China to jointly develop a new 80-85 passenger prop-fan regional airliner.

Beyond China, Mr Hanns Arnt Vogel, MBB's chairman, says he envisages a "worldwide demand" for as many as 1,000 of the aircraft in the 1990s, not least from developing countries.

A final decision on the \$1bn project, expected early next year, will follow feasibility studies now going on at a joint office in Hamburg.

Another important deal was announced in Jakarta. MBB, together with Boeing of the US, has signed an agreement with Indonesian State Aerospace to develop an 85/90-seat commercial aircraft, using prop-fan technology, to be in full production in the early 1990s.

The potential market, according to Indonesia's Minister of Technology, Mr Josef Habibie could be as many as 1,200 aircraft.

These deals are particularly important in broadening the base for MBB which, with annual sales of about DM 6bn, has been operating largely in a European context.

Like other German aerospace companies, its expansion was cramped by post-war Allied restrictions which worked to the benefit of its British and French competitors. It has managed though to find a place in the international aerospace league by participating in a series of joint ventures.

The group is prime German contractor for both the European Airbus civil aircraft venture—in which it holds a 37.5 per cent stake—and the three-nation Tornado military aircraft.

On both the civil and military side, new-generation aircraft are being developed for the next decade. Deutsche Airbus, the consortium's German partner owned by MBB, is seeking to increase its overall participation in the two new civil projects, the short-to-medium-range A-330 and the medium-range 340, which have a combined development cost of \$2.5bn.

Until now mainly responsible for the fuselage, Deutsche Airbus has said it is prepared to build other key sections, such as parts of the wing, helped by a long-term repayable grant of some \$1bn from Bonn.

There are strong indications that Lufthansa, the state-owned airline, may emerge as the A-340 launch customer, boosting the economic viability of the project.

On the military side, production of the Tornado strike aircraft may stretch beyond the original 1989 date thanks to important export orders including some 100 fighters destined for Saudi Arabia. But another order, for 40 aircraft from Turkey, has apparently run into a dispute over financing.

The group's planned joint venture with France to build an anti-tank and combat helicopter has also been bedevilled by rows over equipment and specifications as well as rising costs.

In the longer-term of course, lies the new European Fighter Aircraft or Eurofighter project, in which both MBB and Dornier are to participate as the German partners to Britain, Spain and Italy.

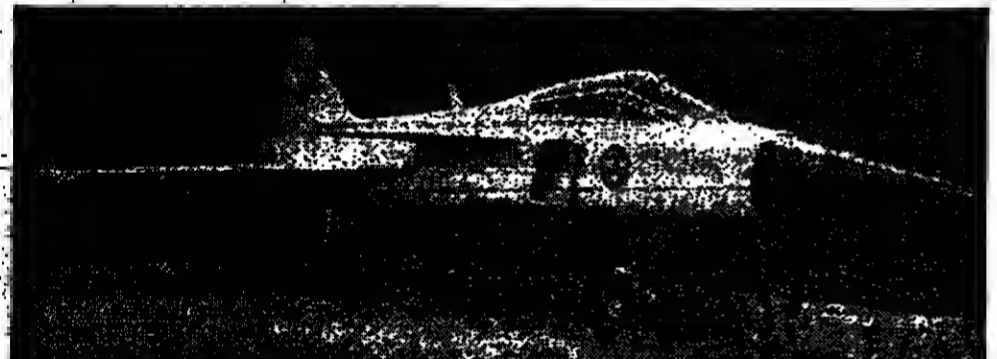
Out of a total industry employment in West Germany of some 71,000, space-related activities are providing only some 4,300 direct jobs, although Germany is participating in the key European space projects including the recently announced \$3bn Hermes manned shuttle for the mid-1990s.

While MBB remains the country's dominant aerospace concern, it has been faced in the past year with a challenge in the form of a powerful new industrial concentration.

Daimler-Benz, the car, bus and truck builder which is one of the nation's biggest industrial concerns, last year took control first of Motoren-und Turbinen-Union (MTU), which is the dominant aero-engines manufacturer, and then of Dornier, the then-family-owned aircraft producer.

The two companies had combined sales last year of DM 4.5bn. Moreover, it has recently emerged that Dornier may be preparing to take a 20 per cent stake in Deutsche Airbus from MBB, assuming the A330/340 project goes ahead.

David Brown



The Saab JAS-39 Gripen supersonic multi-role combat aircraft is now under development in Sweden, and will make its maiden flight next year

John Burton

How to fly a big airplane with the tips of your fingers?

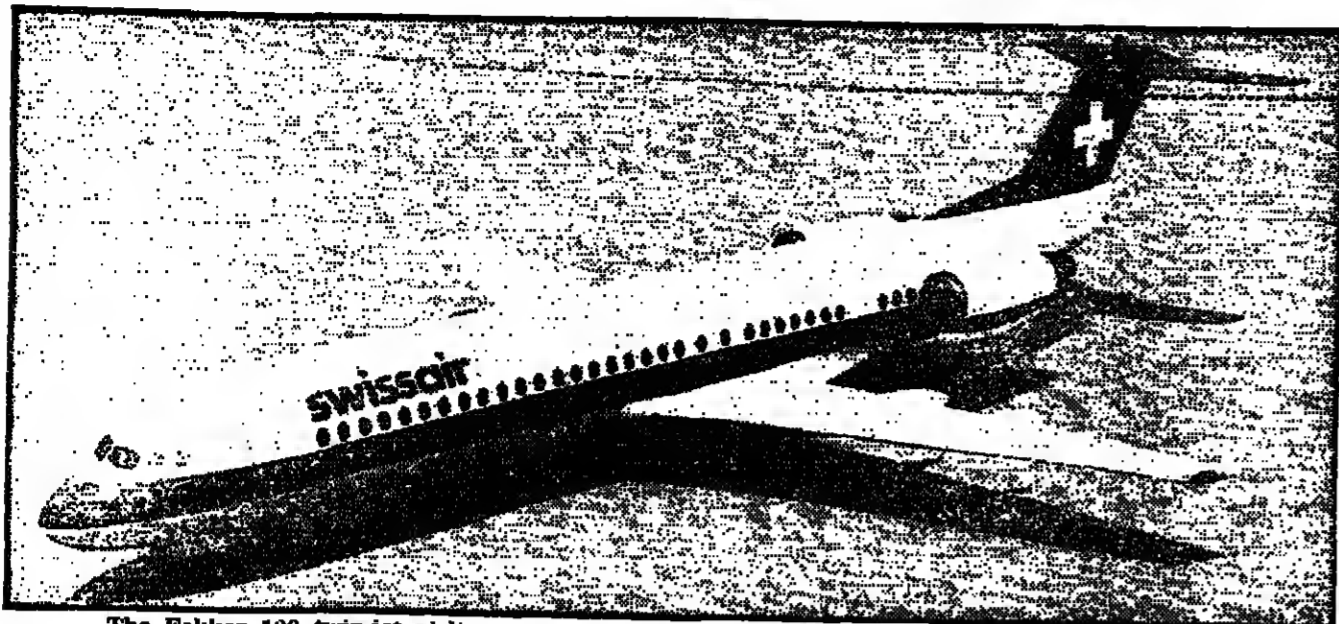
Fifteen years ago, we used in the Concorde technologies never previously seen in a commercial aircraft.

Today, the Airbus remains at the cutting edge of technology. The proof, shortly the Airbus A 320 will be introduced. The first of a new generation of safer, more efficient aircraft. In the new Airbus A 320 "flying by wire" will replace the conventional aircraft controls, making life much easier for the pilot. In terms of comfort, safety and flight monitoring. By means of a sidestick controller, the pilot can transmit extremely precise commands and check they've been carried out on a visual display part of an entirely new concept in cockpit instrument panels designed to make all flight data easily and immediately available to the pilot.

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The Fokker 100 twin-jet airliner, now under development, shown in the colours of Swissair, one of the major customers, with deliveries starting next year

Switzerland

Contracts agreed just in time

SWITZERLAND'S small aerospace industry, concentrated within the Oerlikon-Bührle group, has experienced much relief this year with three important contracts being concluded in the nick of time. Two were for the Pilatus PC-9 primary trainer and the third was a breakthrough order from Canada for Oerlikon's new Adats guided missile system.

Tucano despite, the Swiss claim, the RAF's preference for the PC-9. However, Pilatus' co-operation with British Aerospace brought it into the massive deal under which Britain is to supply Saudi Arabia with 132 military aircraft. Pilatus will provide 30 PC-9s as the primary trainer involved in the deal alongside the 30 advanced Hawk jet trainers.

The value of the contract for the Swiss has not been disclosed but can be estimated at about Sfr 110m (\$65m) and all 30 aircraft will be built in Switzerland. With several unpublished smaller deals, Pilatus now has orders for nearly 130 PC-9s and is expanding the production line at Stans to be able to build 30 a year by 1987, when it should be turning a profit on its new trainer.

The PC-9's predecessor, the PC-7 basic trainer, is still in production, for Mexico among other countries. So is the PC-6 Porter utility aircraft, of which 460 have been delivered over the past 27 years, 100 of them built by Fairchild Industries in the US. Now that its future is secure for the next couple of years at least, Pilatus is planning new projects within the sector it has made its own, the highly versatile turbo-prop trainer or utility aircraft.

Advertisement for Thomson-CSF featuring the headline 'THE SYSTEMS APPROACH.' and a large graphic of a stylized aircraft or missile. The text describes their systems concept and provides contact information for Thomson-CSF in Paris and the UK.

Whether moving about in space or attempting to track aircraft from the ground, modern man would be lost without the aid of electronics. Right from the beginning of aeronautics, the men who founded Thomson-CSF have taken part in the great adventure of aeronautics, designing aviation radiocommunications equipment.

Spain

Combat aircraft of great importance

IN ITS report to shareholders this year Construcciones Aeronauticas S.A., Casa, the Spanish public-controlled aerospace company, signalled that its future could be faced with a mixture of hope and confidence. Mr Fernando de Caralt, Casa's chairman, talks of the company being at "a half way stage" and on "a frontier line."

"I need more grey matter and fewer working hands," he says. The Casa he is building up to 1990 will be a company that has ceased to be what he calls "a giant workshop and nothing more."

It is not surprising therefore that he terms a project to build from scratch a combat aircraft for the Spanish Air Force "of capital importance to our future."

The new aircraft, codenamed the AX, is presently at the design stage. It is intended to replace the Air Force's F-5s and it will be the result of the growing technology that Casa has acquired.

Casa is particularly proud of the carbon fibre expertise developed by its research department. The Spanish company has taken advantage of spin-off deals that followed Spain's purchase of 73 F-16A Tomcats, built by McDonnell Douglas, to supply directly the flaps, fuselage side panels and stabilisers of the US combat aircraft.

The stabiliser technology is now being put to use in the Airbus projects in which Casa has a 4.2 per cent stake, and carbon fibre will be also applied, Casa expects, to the Eurofighter project in which the Spanish company has a 13 per cent stake.

In addition to the European consortium and the McDonnell Douglas link, Casa is also kept in the technology front line through its maintenance contract to overhaul the 100 or so F-15 A's that the US Air Force has deployed in Europe.

A further development is the diversification into missiles thanks to the Spanish Government's purchase of 500 Roland missiles from the French-West German Euro-missile consortium. Under the terms of the purchase, Casa is to be involved in the manufacture of a further 6,000 Roland warheads for export.



The Casa C-212 Series 300 is the latest version of the popular and highly-successful Aviocar, built jointly by Casa and Nurtanio of Indonesia

Belgium

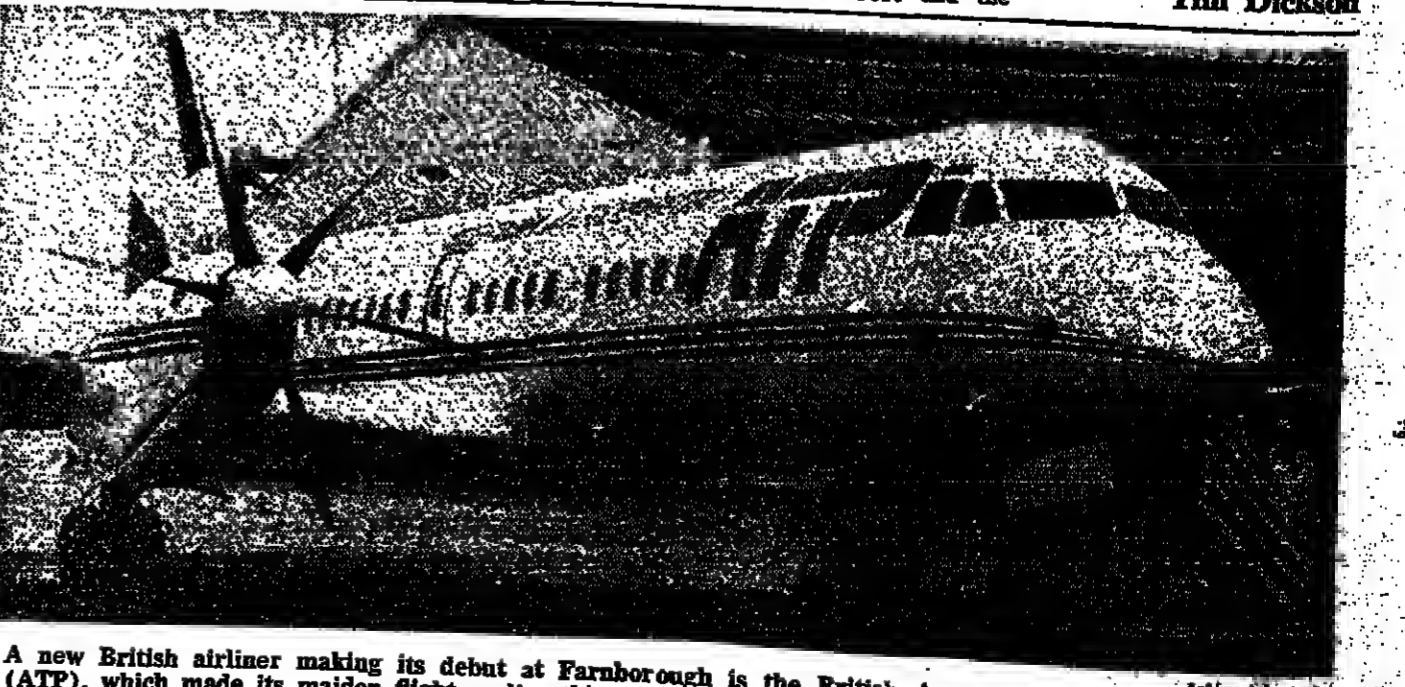
A need to join development

AS A SMALL country Belgium has always stressed the virtues of international co-operation. But while its principal role as sub-contractor to other people's aerospace projects has brought participation in major programmes such as the F-16 fighter, the European Airbus and the Ariane space vehicle, dependence on the outside world leaves its manufacturers inherently vulnerable in a downturn.

Belgian aerospace — the Big Three

Table with 4 columns: Company, Turnover (1979, 1985), No. of employees (1979, 1985). Rows include Sabca, Sonaca, and FN Moteurs (Fabrique Nationale).

There is, nevertheless, a growing awareness of the need to enter new programmes at the development stage, rather than simply buying in an aircraft designed and developed elsewhere and assembling the parts under licence.



A new British airliner making its debut at Farnborough is the British Aerospace Advanced Turboprop (ATP), which made its maiden flight earlier this month. Its features include a new six-bladed propeller and an advanced electronic flight deck. The ATP is one of the quietest airliners now flying

Vertical text on the right edge of the page, including 'POLI to' and 'FLY'.

Aerospace 17

The Netherlands

Construction delays hold up deliveries

FOKKER, the Dutch aerospace group, is levelling off after flying high on a wave of initial orders for its new aircraft, the F-50 and F-100. Missed orders and construction delays have tempered the supersonic atmosphere that surrounded a bulging order book and record profits last year.

Now Fokker is concentrating on meeting its delivery timetable, putting finances in order and possibly expanding abroad—not to mention obtaining fresh orders. Hopes are pinned on several potential sales of the short- to medium-haul F-50 and F-100, which would be the first orders this year for the aircraft that were unveiled in the autumn of 1985.

One of the possible sales involves GPA, the Irish aircraft lease company involved in an embarrassing incident in June when newspaper headlines in the Dutch press suggested a record F1 4.5bn (\$2.03bn) order for 100 aircraft. Trading in Fokker shares was temporarily suspended on the Amsterdam Stock Exchange. Fokker denied the story and a week later GPA ordered 96 aircraft from Boeing and McDonnell Douglas, the American aerospace giants.

GPA, which is backed by Guinness Peat and Aer Lingus, has said it is still interested in the F-100, a 100-seat twin jet that is a successor to the F-26 Fellowship. Fokker would clearly welcome the business but is understandably quiet.

Another disappointment was the recent decision by Scandinavian Airline System (SAS) to buy 14 of McDonnell Douglas's MD-87s instead of the F-100 fanjet. Fokker had been thought to have a good chance at the contract, which could have amounted to more than F1 600m.

Construction delays in the F-100 have also proven disappointing. Deliveries of the aircraft originally were to have been made in April 1987 to Swissair, the launch customer, but that has been delayed until the autumn as have deliveries to KLM Royal Dutch Airlines. Swissair has demanded F1 500m in compensation for late delivery of the first of its eight F-100s and the question now is whether KLM will do the same.

Both the F-100 and the F-50, a 50-seat turbo-prop that is a successor to the F-27 Friendship, were announced 2½ years ago as Fokker's new aircraft for

the late 1980s and 1990s. As modernised versions of the F-27 and F-28, they offer operating efficiency, passenger comfort and manoeuvring ease by using new composite materials of great strength and light weight as well as sophisticated cockpit electronics. Because the aircraft are based on existing designs instead of completely original ones, they are supposed to be cheaper to make and lower in price.

A total of 38 orders plus 31 options for the F-100 are in hand and 33 orders plus 10 options for the F-50 but no new contracts have been signed this year. Fokker needs to sell between 150 and 200 of each to recoup its F1 1.2bn in development costs and has planned a production schedule of 60 aircraft a year.

After years of postponement due to buoyant sales, production of both the F-27 and F-28 are being finally halted this year. Described as one of the most successful aircraft in history, the F-27 has chalked up 788 sales in 63 countries over the past 30 years. Since 1969 some 421 F-28s have been sold in 27 countries.

Construction delays in the pair of new aircraft, though, are believed to have played a role in Fokker's request—which was granted—for another F1 100m in financial aid from

the Dutch Government. The Amsterdam-based aircraft maker has received already more than F1 800m from the Hague to help cover development costs.

Fokker insists that development costs have not exceeded the original F1 1.2bn and notes that the government money is in the form of loans and guarantees and not grants. But the company would still like to strengthen further its balance sheet and is considering one or two sizeable share issues.

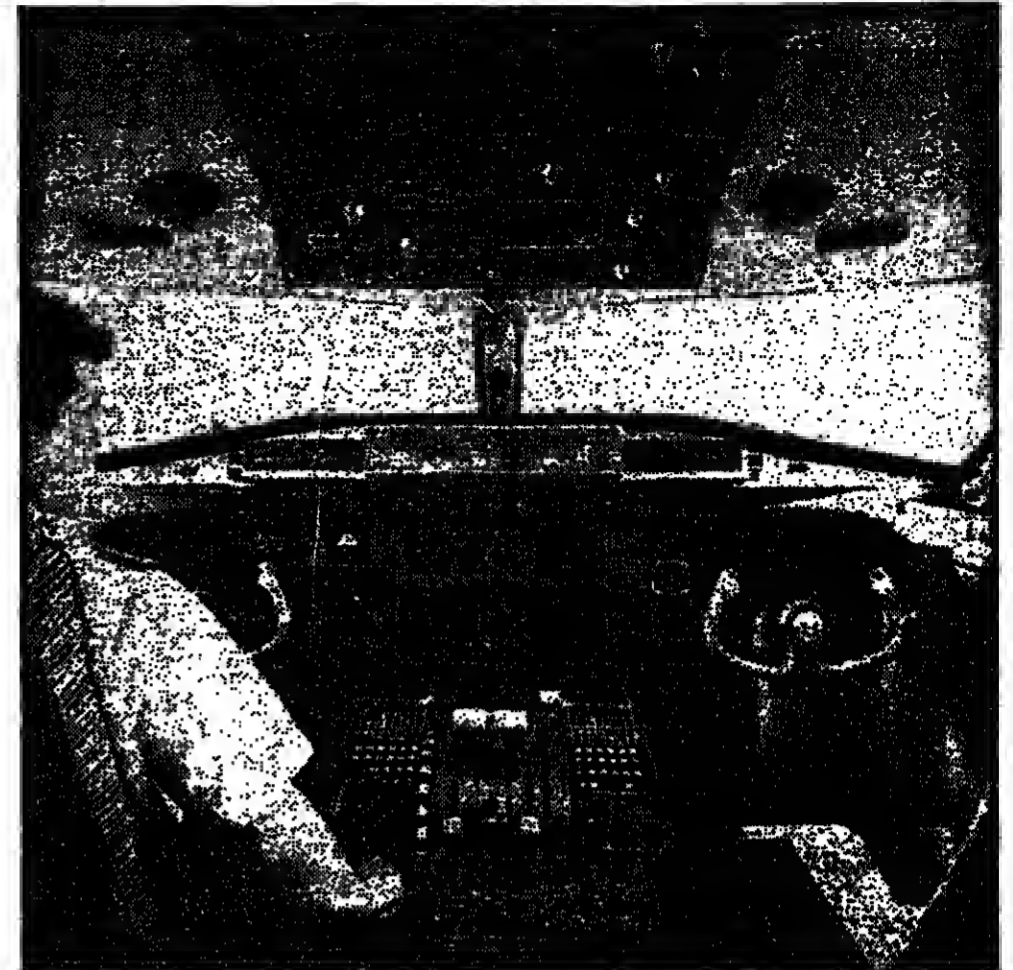
At least part of the proceeds would be used to help finance a new production plant in the US that Fokker would like to build or buy in an attempt to compete better internationally. With sales spread rather evenly around the globe, the aerospace concern is already international oriented. But a deciding factor in possible US production could be the outcome of a huge order from American airlines for as many as 100 F-100s.

Last year Fokker lost a bid to get a foothold in the North American market through the rescue of the ailing Canadian aerospace company, De Havilland, through a consortium. The Canadian Government-owned De Havilland eventually went to Boeing, giving the jumbo-jet maker an entry into the increasingly competitive short- and medium-haul market.

increase Fokker's enthusiasm for taking a 5 per cent stake in the development of Boeing's planned 737 350-seat airliner that will use the revolutionary new propan technology. "We would carry the risk of a prime contractor while we would fulfil the role of a subcontractor," Mr Frans Swartnow, Fokker's chairman, complained to a Dutch newspaper. Fokker is, nevertheless, keenly interested in the propan technology and has an in-house task force studying possible applications.

Meanwhile, Fokker is said to be negotiating with Saudi Arabia for the possible sale of between six and eight F-50s adapted for marine and defence patrol and surveillance. An order of that size would amount to between \$105m and \$140m for the standard aircraft version. It would also most likely involve Hollandse Signaalapparaten, the military telecommunications subsidiary of Philips.

In other aerospace developments, the Netherlands agreed in March to participate for F1 7.5m in the research project for a European Space Agency (ESA) satellite. Participation in the F1 160m research phase is mandatory if Dutch industry is to get a chance at bidding for construction of the observation satellite itself.



The Fokker 100 twin-engine jet airliner will have one of the world's most advanced electronic flight decks, giving the crew instant information on the aircraft's systems

Laura Raum

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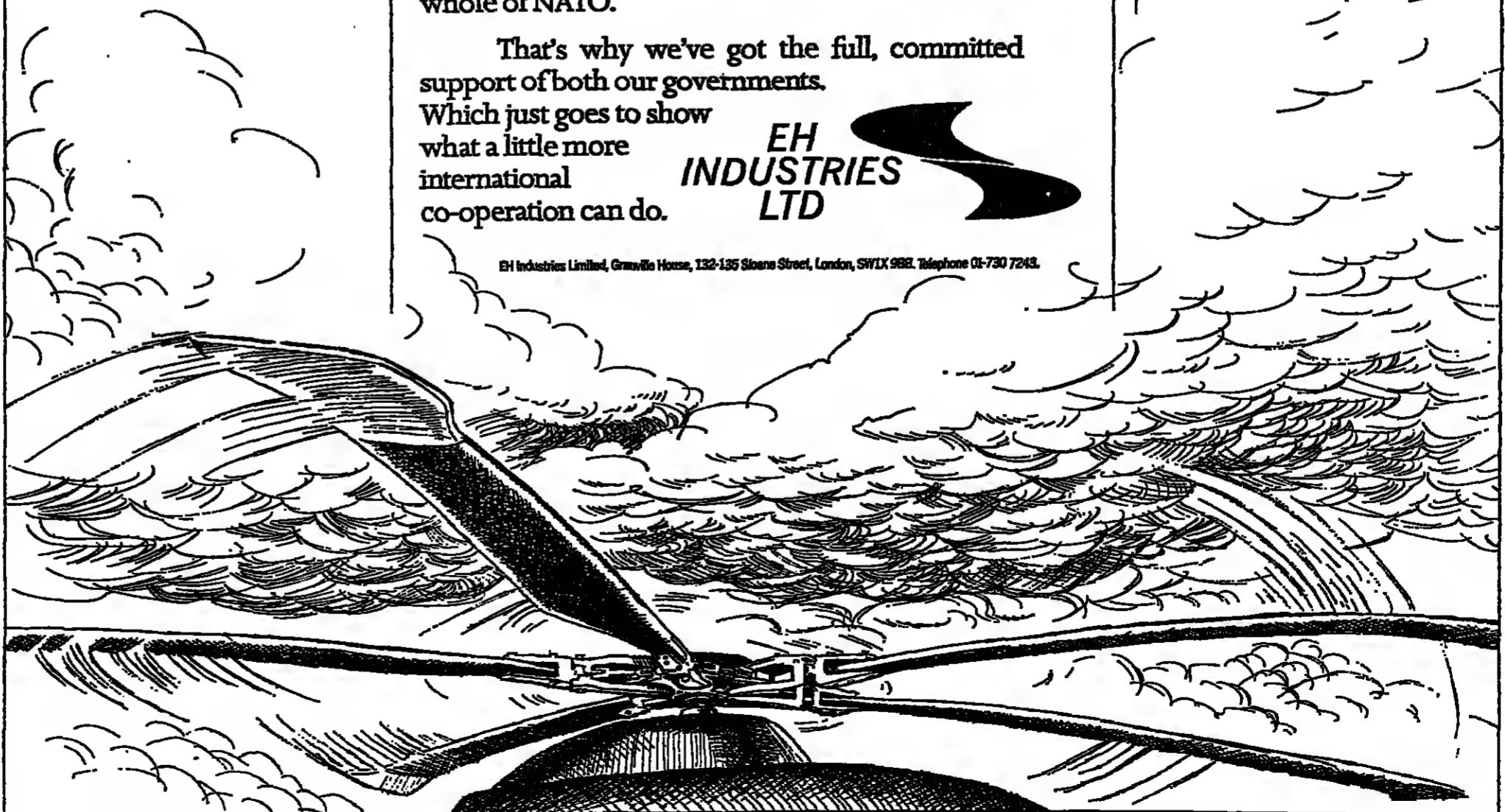
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EUROPEAN HELICOPTER INDUSTRIES

The Italian-Brazilian AMX tactical fighter, powered by Rolls-Royce Spey engines, is being built jointly by Aeritalia and Aeromacchi of Italy and Embraer of Brazil

Italy

Political bars to merger

THIS IS turning out to be an eventful year for Italy's aerospace industry, which is heavily dependent on defence contracts from home and abroad.

The two main companies, Aeritalia and Agusta, are at the centre of a growing political row about whether they should be merged to create a unified Italian business.

The problem is that Aeritalia is controlled by the IRI-Finmeccanica state holding group, which in turn is influenced by the Christian Democrat Party. The smaller Agusta helicopter maker, which faces other problems as well, is 97 per cent owned by the Eni state holding group, Italy's smallest such state group and close to the tiny Social Democrat Party.

Prof Romano Prodi, the dynamic chairman of IRI, senses that it would make sense to bring the two aerospace companies together. But his patrons in the Christian Democrat Party may not be willing to risk the trade-offs involved in the political bagging which would be required to achieve what in other countries might be seen as intelligent and commonsense industrial rationalisation.

The year made an eventful start when Agusta was a member of the European consortium along with Aerospaziale of France and Messerschmitt of West Germany which made its unsuccessful rescue bid for Westland of the UK.

Not only was the Euro-bid beaten by United Technologies and Fiat, but Agusta and Fiat rowed in public at home over the issue. Once again, political rivalries infected the Italian aerospace industry, doing damage to all concerned.

These problems notwithstanding, the industry did manage a healthy 1.680 trade surplus last year. Total industry turnover increased by 15 per cent to 14,800bn.

Neither Agusta nor Aeritalia are large when compared to aerospace companies in France or Britain. In 1985, for example, Aeritalia's total consolidated turnover came to 11,377bn, while Agusta's was 1,128bn. The smaller

and third biggest Italian aerospace company, Aeromacchi, had 1985 sales of 1,240bn. Something like 75 per cent of the orders received by Aeritalia and Agusta are defence-related, while Aeromacchi is totally defence-oriented. The boom in exports of recent years appears to be over and certain projects under way, although heavily promoted, have yet to achieve the orders to justify the investment. Take, for example, the Aeritalia-Aeromacchi programme to build the AMX light fighter and ground attack aircraft. Brazil's Embraer has 30 per cent of the AMX project and a production line in Brazil.

Italy and Brazil both hope the AMX will be suitable not just for their own air forces, but also for those of developing countries. But the only orders won so far are the 270 aircraft ordered by Rome and Brasilia.

One achievement, not in the defence area, is the recently-completed Avellan turbo-prop computer aircraft built by Aeritalia and Aerospaziale of France. The ATR 42, or Hummingbird, is designed to relieve long-suffering business flyers in Italy. Orders have been picking up.

Back in defence, Aeritalia is hoping to translate the experience it gained on the Anglo-German-Italian Tornado by picking up a larger share of the planned European Fighter Aircraft (EFA) project.

Agusta, meanwhile, is still collaborating with Britain's Westland on the EH-101 naval helicopter. Some 2850m has been spent on developing the EH-101. So far there are only 90 orders which are firm.

There are other examples of Italian aerospace companies working with one another, with foreign companies, and at times in rivalry with some of the same companies.

That a restructuring of the industry would make it more effective appears logical. But the main problem it faces remains not technology or finance: it is the fact that its biggest companies are often subject to political whims rather than industrial logic.

Alan Friedman

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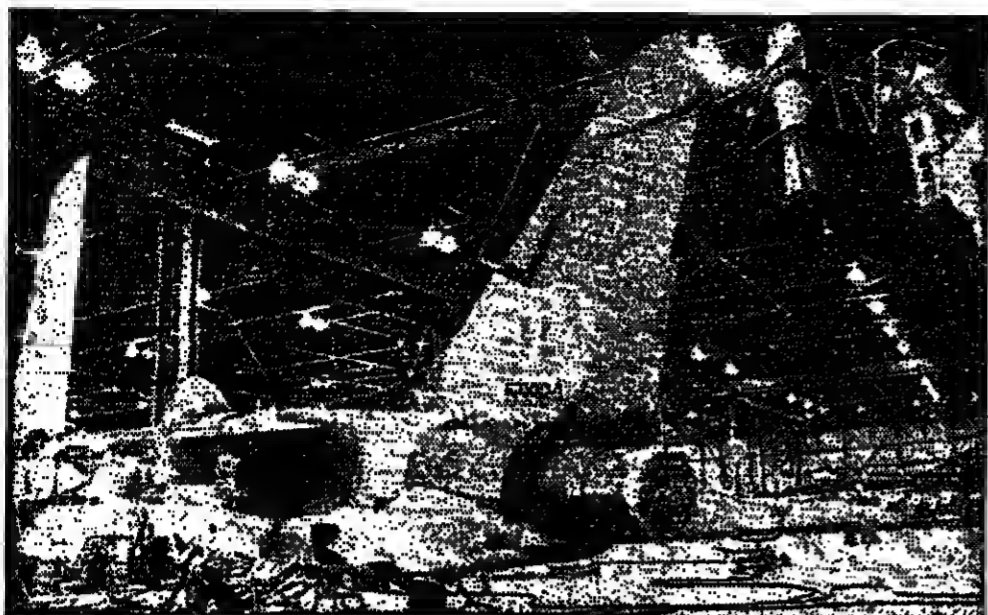
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Aerospace 18

Australia

Offsets policy brings benefits



Hellenic Aerospace Industry (HAI) has developed a substantial overhaul and maintenance capability for military aircraft. Shown here is a Greek Air Force A-7H Corsair fighter undergoing maintenance

Greece

Breakthrough parts deal

THIS HAS BEEN a breakthrough year for the Hellenic Aerospace Industry (HAI). Following the signing of a \$1.2bn contract in Paris in June, HAI is set to begin manufacturing a range of parts for the Mirage-2000 fighter aircraft, a significant expansion of its manufacturing activities which the Greek state aerospace concern has long been anticipating.

General Dynamics are expected to be completed by mid-autumn. So far, HAI's manufacturing activities have included airbrakes for the Mirage-2000, Airbus doorframes, and, under a kick-off contract signed with British Aerospace last December, valued at \$12m, flap assemblies for the new Advanced Turbo-Prop (ATP) airliner.

In addition the company, whose \$400m plant established in the 1970s with managerial and technological help from Lockheed International represents one of the single largest industrial investments in Greece, saves the state millions of dollars each year in vital foreign exchange by handling repair and maintenance for the Hellenic Air Force, and to a more limited extent the state carrier Olympic Airways.

HAI's role as a foreign exchange earner and saver counters, in the management's view, the fact that the company is running at a loss. HAI is in any case proud of having trimmed losses from Drachmas 1.5bn in 1981 to Drachmas 15m in 1983. The company's foreign debt has also been halved in the same period, from \$320m to \$163m, and the ratio of own to borrowed capital improved from 1:14 to 1:9.

The company, which employs 3,200, has been all-Greek since terminating the contract with Lockheed nearly two years ago, a move designed to "Hellenise" HAI as much as to save some \$300m a year in salaries.

Andriana Ierodiaconou



Australian Airlines, formerly Trans Australia Airlines, is spending more than A\$1bn on new aircraft, including 12 Boeing 737-300s, the first of which (seen above) has now been delivered

As a consolation to Hawker, it was awarded the contract to build the aircraft under licence from Pilatus, a condition Pilatus agreed to in order to clinch the deal.

The condition comes under the Australian government's offsets policy which requires foreign suppliers of government contracts worth at least A\$2.5m to pass on part of the contract-related work to Australian industry. The offset work required is at least 30 per cent of the value of the contract. They are required on both civil and defence purchases and the biggest suppliers so far under the policy are the US, Britain, West Germany, Japan and France.

The aerospace industry in fact stands to benefit the most from the offsets policy, in terms of both contract value and technology transfer. The Defence Department and the government-run airlines are currently on a buying spree for aircraft and equipment, promising profitable contracts for foreign suppliers and Australian companies.

worth A\$500m awarded last May to United Technologies of the US. The order was won in the face of strong competition from France's Aerospatiale which offered its Super Fuzee helicopter.

Emilia Tagaza

Brazil

Latest thinking in unorthodox turboprop



A Brasilia airliner nears completion at the Embraer factory

THE Farnborough Air Show is in for some drama as Embraer, Brazil's aircraft manufacturer, shows its new-generation, 160-seat pressurised turboprop transport. The yet-unnamed aircraft, designated EMB-123, which has two backward-facing turbo-propellers attached to the front fuselage section, is an advanced aircraft that makes full use of some of the latest thinking in civil aircraft design.

Intended for commuter traffic and carrying a price tag of under \$9.5m, the aircraft is planned for service in 1990 as a replacement for the company's successful Bandeirante, the twin turbo-prop aircraft of which 480 have been sold worldwide since 1972.

The EMB-123 features unorthodox aerodynamic concepts for this category of aircraft, Embraer says, and makes extensive use of composite materials such as carbon fibre in its construction. It will cost an estimated \$200m from development, prototype construction, testing, and certification to tooling for series production.

On the military side, a new contract for more services in Europe with the recent changes in air traffic regulations which allow regional airlines to expand their routes to cross-border destinations.

Brook of Belfast to equip Britain's Royal Air Force, is making inroads in Latin American markets as well. Venezuela has requested a contract of 30 ordered as part of a bi-national countertrade arrangement.

Ann Charters

Israel

US pressure to cancel combat aircraft

MORE THAN at any previous moment in its up-and-down history of 30 years, the fate of the Israeli aerospace industry today hangs in the balance.

With a cheaper, American-made alternative. Between 240 and 300 copies of the aircraft are expected to be built for the Israeli air force by the end of the century, at a cost of anywhere between US\$ 14.5m and US\$ 22m.

US\$ 1.1bn has already been committed, much of it US military aid money. Cancellation costs would add another US\$ 250m or so.

demands on those funds from other departments of the Israeli armed forces is increasing markedly. Senior officers within the Israeli high command have made their objections known in public to the aircraft, regarded as a threat to their own re-equipment programmes.

ing the development costs, lowering the political risks of cancellation and creating a potential export product.

Advertisement for Fuller Peiser, Property advisers to the aerospace industry for over 60 years. Includes text: 'After taking our property advice, the aerospace industry was over the moon.' and contact information for Travis House, 1-4 Holborn Circus, London EC1N 2HL.

Advertisement for the Dash 7 Series 150 aircraft. Text: 'The only 50 passenger aircraft that can handle the Docklands.' Includes an image of the aircraft and contact information for de Havilland Aircraft Company of Canada.

For Israel, the US\$ 2.5bn (at current prices) Lavi project has become a major source of employment, the means to stem a brain drain abroad and, above all, a symbol of the country's determination to achieve as high a degree of self-reliance as possible in the field of armaments.

Andrew Whitely

Aerospace 19

Singapore

Big increase in sub-contract work

ALTHOUGH IT lacks the heavy industrial infrastructure necessary for the manufacture of complete aircraft, Singapore has substantially increased its aerospace activities in recent years.

It has done so largely by providing aircraft and engine overhaul, maintenance and refurbishment facilities; and by supplying electronics and other small components to overseas aerospace manufacturers.

The skills of the Singapore workforce and the encouragement of the Singapore Government led overseas aerospace companies some time ago to sub-contract component and equipment manufacture and assembly to companies in the republic. Today this business provides substantial employment, and makes a significant contribution to the country's economy.

Primarily involved in this business is Singapore Aircraft Industries (SAI), formed early in 1983 as a government-owned industrial group under control of the Ministry of Defence and Singapore Aerospace Maintenance Company (SAMCO), Singapore Electronic and

Engineering (SEE), Singapore Aerospace Manufacturing (SAM), Singapore Aero-Components Overhaul (SACO), and Singapore Aerospace Warehousing and Supplies (SAWS). The jointly owned ventures are Singapore Aero-Engine Overhaul (SAEOL), co-owned with Singapore Airlines; and Sunasero Company, co-owned with Aerospatiale of France.

Collectively, the SAI group has a combined experience of more than 20 years in the aviation industries. The group offers a range of products and services that spans higher-echelon maintenance, and the repair and refurbishment of aircraft such as the C-130 Hercules, A-4 Skyhawk fighter jets, Strikemasters, and US Bell and French Aerospatiale helicopters.

It also offers overhaul and servicing for aircraft-related components: airborne radio, navigational and instrument systems, telecommunications, defence, electronic and weapons systems; test-equipment calibration; and the manufacture of aircraft parts and assemblies.

Singapore's growing interest in aerospace is indicated by the fact that, last January, the third Singapore biennial aerospace exhibition was the biggest yet, attracting over 100 companies from all over the world exhibited; making it the largest aero-

space exhibition in the Far East and South-East Asia although the Indonesian air show is now a close rival. Most of the western world's major aerospace manufacturers attended.

One reason for this success apart from Singapore's growing direct involvement in aerospace engineering, is that the Far East, and the south-east Asian and Pacific basin as a whole, is the world's fastest growing region in civil aviation. It is described by Mr Cheong Cheong Kong, managing director of Singapore Airlines, as the "future dynamo of the international civil aviation industry."

"It has not only become the focus of growth, but also the catalyst for growth beyond its own boundaries," he says.

"Over the past 20 years, Asia-Pacific has been the world's fastest-growing region."

It's newly-industrialised countries, spearheaded by Japan, have emerged as major trading forces. All of the region's economies are vigorous, export-orientated, and dedicated to expansion. They provide an attractive environment for foreign investment as well as trade in general.

"The new suns rising in the region have not escaped the attention of the world's trading giants. In 1983, the US-Pacific trade was 24 per cent greater than the US-Europe trade,

having surpassed the latter in 1978."

This situation applies to aerospace manufacturing as well as civil air transport. Many major western aerospace companies now retain offices in Singapore, and have direct links with the growing Singapore aerospace industry. Others plan to, and the biennial Singapore exhibition has had much to do with this. It is proposed to hold the next one at Changi Airport from January 27-31, 1988.

It has been recognised that this form of international aerospace collaboration is the swiftest method of developing high-technology skills, thus helping to promote the economic well-being of the country.

At the same time, the Changi Exhibition brings together the aerospace exports of other countries with an interest in the entire Asia-Pacific arena, with the spin-off effect of promoting Singapore as the focus of aerospace development in the region.

The country faces considerable competition, however. Neighbouring Indonesia is already rising rapidly as an indigenous aircraft manufacturer, especially of light transport aircraft. And the Japanese aerospace industry is a formidable force in world markets, especially since it has the cash

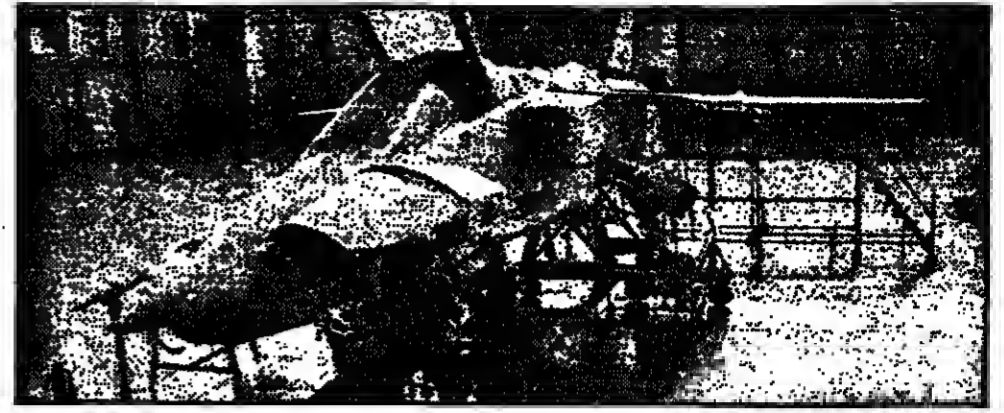
available to buy its way into new western aerospace programmes, such as the projected Boeing 737 prop-fan 150-seat airliner. Malaysia, too, is increasingly interested in promoting its aerospace industry as a potential major contribution to the economy.

Overshadowing everything in far eastern aerospace is the growing power of the People's Republic of China, which, over the past two to three years, has been arranging co-production and other deals with western aerospace manufacturers with a view to modernising its own industry.

Singapore recognises that, with its own limited population and financial resources, it is never likely to become involved in large-scale manufacture of indigenously-designed aircraft, especially in the light of today's rising research, development and production costs, at least on a directly competitive basis with Japan and Communist China.

But, as a major supplier of equipment, components and sub-assemblies, and as a major overhaul, maintenance and refurbishing centre for both civil and military aircraft, it is already a major force in the Asia-Pacific region.

Michael Donne



Final assembly of a Jaguar jet strike-trainer, built under licence by Hindusthan Aeronautics of Bangalore

India

Merger to bring savings

INDIA'S AVIATION is poised for major structural changes in the next year or two following the government's decision to merge Air India, the international carrier, with the domestic Indian Airlines. The complicated work involved in the amalgamation will probably take more than a year but, after it is completed, economies worth about Rupees 1bn are expected.

Both companies are doing well, even at a time when most of the world's airlines are going through a difficult phase. Air India made a record profit of about Rupees 650m in 1985-86, partly from its lucrative Gulf routes, and Indian Airlines made a profit of Rupees 587m.

The reason for the merger decision is the need to reduce overheads and 'avoid duplication of operations, particularly in maintenance and engineering workshops. There is also a great deal of complementarity between them, especially now that Air India has recently added the Airbus A-310 to its fleet.

Indian Airlines already uses the Airbus A-300 on its main trunk routes in the country and on some of its services to neighbouring countries. Earlier this year, it signed a \$1bn contract with Airbus Industrie for 19 Airbus-A320s (with an option for 12 more), and this will give both airlines aircraft made by the same company.

Staff and other economies should be possible as a result, although some resistance from trade unions is likely.

Two major developments will add to India's growing aviation industry. The government has established a helicopter corporation based on Westland W-30s and Aerospatiale Dauphins. These will help the Oil and Natural Gas Commission's offshore operations as well as provide helicopters for use inside the country.

The government has also decided to permit the use of air taxis in India. These will be based on small executive aircraft already available and so no foreign exchange purchases will be involved. This should fill a long-felt business need for chartering small aircraft.

Militarily, the government-owned Hindusthan Aeronautics is gearing itself to make the latest of the MIG series—agreement was reached in July. The aircraft is the MIG-29, code-named Fulcrum in the West, which so far has been flown only by the Soviet Air Force.

Hindusthan Aeronautics is already assembling the Jaguar under a deal with British Aerospace but plans to manufacture the Mirage 2000 (40 are to be bought outright and a deal for a few more is expected to be signed soon) have been abandoned.

Hindusthan Aeronautics says that its plans to develop its own "light combat aircraft" which will be used in the 1990s, are on schedule. The airframe has already been designed but until India can make its own gas-turbine engine (coded GTX), the aircraft will be powered by an imported engine.

In the running for this contract are General Electric's F-404 and the Rolls-Royce RB-199.

K. K. Sharma

Michael Byrnes

Indonesia

Commercial battle over military contract

HIGH ambition in the Indonesian aerospace industry has its roots in a decision by President Suharto in the early 1970s to launch the country directly from poverty into technological orbit. Now, after a 15-year record of achievement on a scale which few might have thought possible, the growing aerospace industry is tightly woven around the unusual personality of Dr B. J. Habibie, Indonesia's Minister for Research and Technology.

Dr Habibie is so obsessed with building up this high-technology end of the Indonesian economy that he lives and breathes aeroplanes. The desk in his Jakarta office is crowded with models of advanced aircraft. Design charts of the CN-235, Mr Habibie's

newest aircraft, stand between the piles of documents which he surrounds himself with during his long working day.

Ten years after the establishment of the Nurtanio aircraft factory in Indonesia, Indonesia this year held its first international air show—again with more success than most observers believed likely.

The main result has been a heightening of international interest in Indonesia as a market for high-technology aircraft and as a possible location for component manufacture.

The commercial battle which broke out between the American F-16 manufacturer General Dynamics and the maker of France's Mirage 2000, Marcel Dassault Breguet, was largely as a result of the air show and

a typical product of the Habibie approach.

At the time of writing it seemed likely that Indonesia would still opt for the F-16, but only after the US manufacturer was forced to fight—largely on the proportion of local manufacture—to stay in the race.

Dr Habibie's first dream is aircraft technology for Indonesia; his second centres on local component manufacture at the most sophisticated level. He is aiming to reach the same stage of aerospace technology as European, American and Japanese industries in 10 years.

Another spin-off of the air show was a reported offer by Panavia—the joint venture between Britain, West Germany and Italy—to manufacture the Tornado jet fighter under

licence in Indonesia. But this is still in its early stages.

The most recent development in the industry was an agreement between Boeing and the Indonesian Nusantara Aircraft Manufacturing Co., or IPTN, the new name for the Nurtanio Company, signed during the air show. This involves Boeing taking Indonesian hardware in return for its aircraft.

Indonesia already has agreements with five international groups for the local production of a range of aircraft. The latest involves co-production with Casa of Spain of the jointly-designed CN-235, known in Indonesia as the Tetuko and in Spain as the Elena.

Other agreements are with MBB of West Germany for the production of the BO-105 heli-

copter; with Aerospatiale of France for the Superpuma AF 332 helicopter; and with Bell of the US for the production of the 412 helicopter.

IPTN has an arrangement with General Electric to set up and operate the universal engine maintenance centre in Bandung, the west Java site of IPTN's main factory. The centre is expected to be in full operation by 1988. IPTN also has manufacturing arrangements with the domestic Indonesian airline, Merpati Nusantara Airlines.

IPTN's Bandung aircraft works are already connected with largely unpublished research into missile production at a separate but nearby facility.



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Aerospace 20

China

Links with the West increasing

THE People's Republic of China will be sending a big mission to the Farnborough Air Show.

While the Chinese will have an exhibition in the big covered hall on top of the hill overlooking the runway, which is expected to indicate some of the capabilities of the Chinese aerospace industry, the mission's primary aim will be to discuss with a wide range of Western aerospace industry representatives how they can work together in the years ahead, to their mutual benefit.

The Chinese team will include representatives of China Promotion, China Aviation Supplies Corporation, China National Electronics Import-Export Corporation, China National Aero Technology Import-Export Corporation (Catie), China North Industries Corporation and China Precision Machinery Import-Export Corporation.

Such Chinese missions have been seen increasingly at Western air shows in recent years, reflecting the expanding interest in what the West has to offer technologically in aerospace. The missions also show a readiness to take advantage of the eagerness of Western companies themselves to do business in the vast and growing Chinese aerospace market.

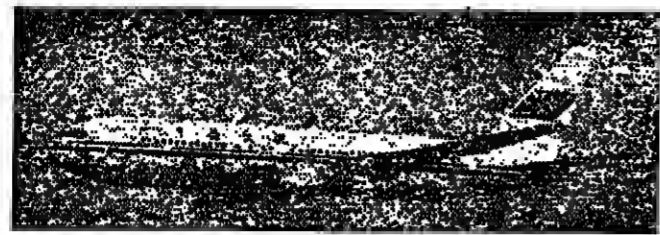
The State aircraft factories are located principally at Shenyang, Xian, Shaanxi, Harbin, Shanghai, Beijing, Nanchang, Hangzhou, Tianjin, Shijiazhuang and Chengde.

For the early part of the post Second World War period, the industry depended on the manufacture under licence of designs originating in the Soviet Union — before the political rift of 1960 and then the Cultural Revolution, which also affected the aerospace industry with its anti-technology bias.

This dependence on old Soviet designs continues, and is still to be seen across the spectrum of Chinese aerospace activities, including fighters (such as the Shenyang J-8 air superiority aircraft) bombers (such as the Xian H-6 based on the Tupolev Tu-16 or Badger), and the Hangzhou Y-5 four turbo-prop transport derived from the original Antonov An-12.

More recently, the efforts to undertake development from designs other than a Soviet origin have yielded the Shanghai Y-10 four-jet transport.

Although this has similarities



The Chinese Shenyang F-6 fighter, based on the Soviet Union's Mig 19 design (below) and the Boeing twin-engined 767-300 ER (Extended Range) airliner for the Civil Aviation Administration of China.



to the Boeing 707, development began before the first Boeing 707s were sold to China, and the aircraft was undertaken to demonstrate the Chinese industry's ability to develop aircraft of such a size on its own.

However, quantity production of the Y-10 apparently is not intended, at least so far, and the Chinese air transport industry continues to depend on Western manufacturers for most of its modern equipment.

This was apparent at the major Chinese aerospace exhibition, China Aviation Expo '84, in Beijing at which Western manufacturers of all types of aerospace and civil aviation equipment were invited to show what they had to offer.

Not only as a direct result of that exhibition, but also because of some long, hard and patient salesmanship by Western aerospace companies, Chinese purchases of foreign-built civil aircraft have expanded considerably over the past 18 months.

Major deals have included procurement of British Aerospace Type 146 four-engined regional jet airliners, European wide-bodied A-310 Airbus, the smaller Short Brothers' Type 360 twin-engined turbo-propeller 36-seat regional aircraft, and

in China including some parts for the BAe-146 regional jet airliner.

The eventual number of MD-80 type aircraft the Chinese will build is not known, but it is recognised that with that country's growing civil air transport industry, its demand through the rest of this century for transport aircraft will run into many hundreds of all types, ranging from small turbo-prop feederliners through to big, longer-range types.

The Chinese industry is already showing a strong interest in the emerging prop-fan form of propulsion. The Shanghai Aviation Industrial Corporation has already linked with McDonnell Douglas in the latter's plan to develop the MD-91X prop-fan airliner for the early 1990s.

Also, more recently at the Hannover Air Show, it was announced that the Catic organisation had signed an agreement with the West German Messerschmitt-Bolkow-Blohm to co-operate on the development of a 75-passenger commuter-sized prop-fan airliner, the MPC-75.

The aim is to undertake a feasibility study by mid-1987, and the partners will then decide whether the market will support full-scale development.

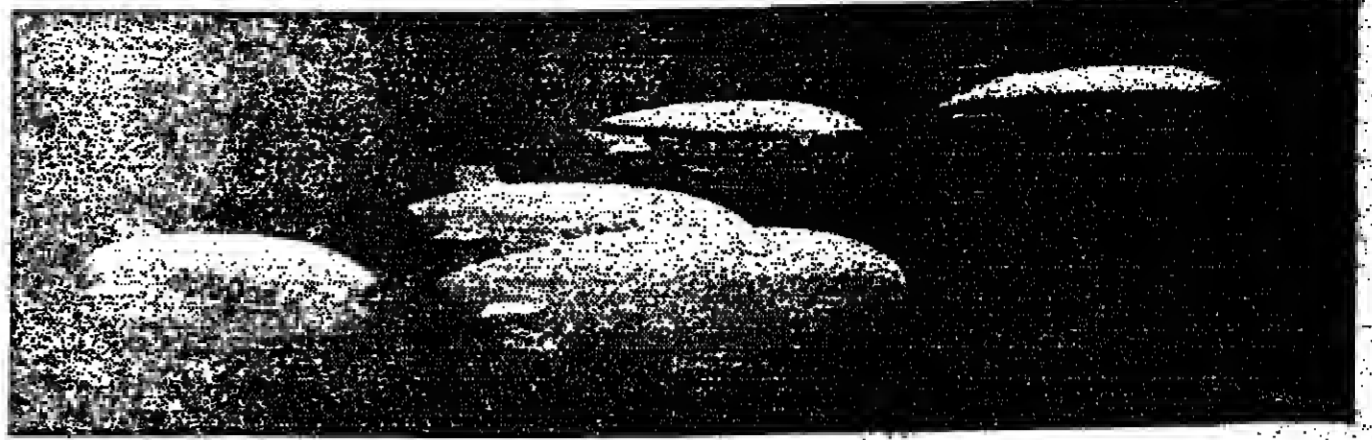
The view is that it most likely will, for it is estimated that the world market for aircraft in the 70 to 90-seat passenger size will amount to more than 900 aircraft by the early 21st century with China itself likely to need about 250 such aircraft.

This interest in the prop-fan indicates that Chinese aerospace planners are alert to the most recent developments of the Western aerospace industries, and are anxious to get some part in them.

Other manufacturers besides McDonnell Douglas and British Aerospace are anxious to get footholds in the Chinese market, both through direct sales to Chinese airlines (especially as more of these are emerging under the reorganisation of air transport in that country) and through the manufacture of parts and equipment.

Thus, the sales teams are regularly visiting China in growing quantities, and it is hoped that as a result of the strong Chinese presence at the forthcoming Farnborough show, significant further sales will result in the year ahead.

Michael Donne



Impressive line-up of airships built by Airship Industries of the UK shows how production of this type of craft is now expanding, both in the UK and the US, where the company has bases.

Airships

Expansion in uses and technology

THERE ARE many companies, in various parts of the world, involved in the manufacture of balloons (either manned or unmanned), and other types of lighter-than-air craft for a wide variety of uses.

However, the two companies most actively engaged in the development of airships—that is, manned, powered and steerable craft capable of carrying passengers and cargo payloads—are Airship Industries of the UK and Goodyear Aerospace, a wholly-owned subsidiary of the Goodyear Tire and Rubber Company of the US.

Goodyear has been involved with airships (which it calls Blimps) for many years, and has built over 300, more than any other company in the world, of which over 250 have been for the US Army and Navy, and the rest commercial craft.

Goodyear currently operates several non-rigid airships for public relations and sales promotion activities, of which the four most recent are the America (NSA), Columbia and Europa (NSA) and Enterprise (NIA).

Goodyear of Akron, Ohio, is now constructing a major new advanced technology airship, called the GZ-25, a nine-passenger craft designed to fly at a speed of about 65 knots, and due to make its maiden flight late next spring.

This craft will be the first in the world to use gas turbine power, with two Allison 420 hp turbo-propeller engines. It will also include a new electronic control system which replaces the usual mechanical control wires with lightweight electri-

cal connections. Airship Industries, known as AIL, set up in the UK in 1978, is now owned 49 per cent by Bond Corporation of Australia, with Westinghouse Electric of the US holding 3 per cent and Ansett Transport Industries of Australia a small percentage, and the rest in the hands of institutional and private investors.

The Westinghouse interest is part of an overall \$8m deal agreed earlier this year whereby a "joint venture" company was set up in the US by AIL and Westinghouse to pursue military and other business.

A comparable joint venture company has been set up with Ansett Transport Industries, called Asian Pacific Airships, to market airships in the Pacific Basin region. AIL's philosophy is to create further such companies where it can so as to exploit the overall potential of airships as widely as possible.

AIL itself has to date built two separate types of craft—the Skyship 500 and the larger Skyship 600. The Skyship 500, which first flew in 1981, is a four- to six-passenger craft, with a maximum speed of about 55 knots and an endurance (at a speed of 30 knots) of about 19 hours. The larger Skyship 600, which first flew in 1984, is a 12- to 14-passenger craft, with a maximum speed of 60 knots and an endurance of about 24 hours.

AIL says its Skyship series has been designed to make extensive use of advanced high-strength, lightweight materials such as Kevlar, glass-

reinforced plastic and honeycomb sandwich composites. The envelope material, a high-strength, low-permeability polyester, was developed specifically for this range of airships. The use of non-combustible helium as the lifting gas has eliminated the dangers associated with the earlier use of hydrogen.

Power in the Skyship 600 is provided by two turbo-charged Porsche engines, driving five-bladed variable pitch propellers in ducts on either side of the passenger gondola, slung beneath the craft's hull.

The ducts surrounding the propellers serve to reduce propeller noise levels both in the gondola and on the ground, while also improving safety for ground crews and boarding passengers, and increasing overall propeller efficiency.

AIL, with bases at Cardington, Bedfordshire, and Weaverville, North Carolina, now has the largest fleet of airships flying, with a total of nine Skyships operational in the US, Europe, Australia, and Japan, another (a Series 600) nearing completion, and two more awaiting assembly.

The company has sold its Skyship 600 craft to Resorts International of Atlantic City, New Jersey, and to Swan Television of Perth, Western Australia—the latter craft, which made its maiden flight in May, this year, will be used extensively as a camera platform during the America's Cup yacht races in 1987. AIL has sold a Skyship 500 to Japan Airship Services, a subsidiary of Japan Air Lines. The other craft it uses itself.

Recently, AIL has also submitted a bid to the UK Ministry of Defence in the competition to find an alternative to the delayed Nimrod Airborne Early Warning (AEW) aircraft.

The company is proposing the use of a 100-ton airship which it claims could stay on station for three or four days at a stretch, and have operating costs of only about one-third of a conventional aircraft.

AIL is concentrating a significant volume of its resources on its bid for the big \$40m-plus US Navy contract for an oceanic fleet surveillance airship, under the Navy Airship Programme, or NSP, for which both Goodyear and also Boeing of the US are bidding.

This programme calls for a large "forever-on-station" craft for overboard surveillance of the fleet, with the airships carrying giant antennae capable of detecting incoming cruise missiles.

The studies by AIL and Westinghouse in their joint bid for this contract will be submitted to the US Navy soon, in response to a "Request For Proposals." The US Navy will then take some time to evaluate the proposals from all parties, and a decision may come either later this year or early in 1987.

Whoever wins that contract will be assured of a major airships' production programme lasting many years, quite apart from the substantial boost it will give to the ultimate development of commercial airships.

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